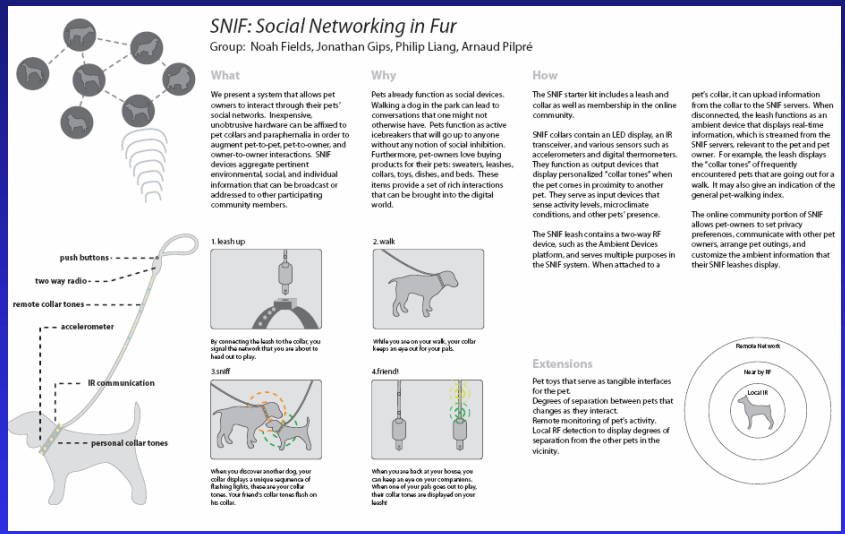
From Disasters to WoW: Enabling Communities with Cyberinfrastructure



Noshir Contractor

Professor, Departments of Speech Communication & Psychology
Director, Age of Networks Initiative, Center for Advanced Study
Director, Science of Networks in Communities -
National Center for Supercomputing Applications
University of Illinois at Urbana-Champaign
nosh@uiuc.edu

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
TM

NCSA

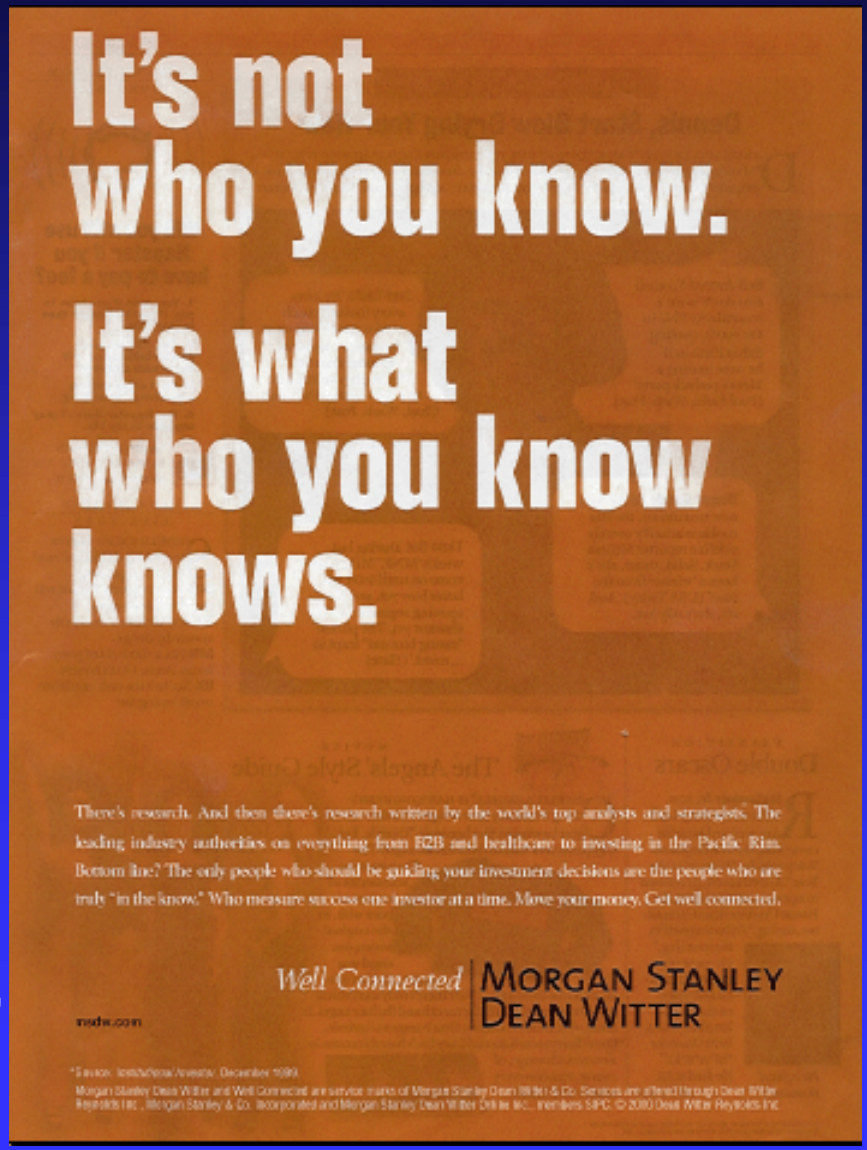
Lovegety

1. Turn on power & set MODE with MODE button. You can confirm the MODE you chose as the red indicator blinks.
2. Lamp blinks when (someone with) a Lovegety for the opposite sex set under the same MODE as yours comes near.
3. FIND lamp blinks when (someone with) a Lovegety for the opposite sex set under different mode from yours comes near. May try the other MODES to “GET” tuned with (him/her) if you like.

Aphorisms about Networks

- Social Networks:
  - Its not what you know, its **who** you know.
- Cognitive Social Networks:
  - Its not who you know, its **who they think** you know.
- Knowledge Networks:
  - Its not who you know, its **what they think** you know.

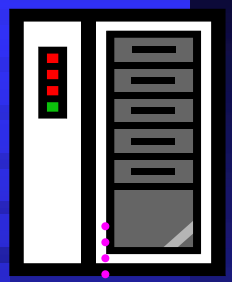
Cognitive Knowledge Networks

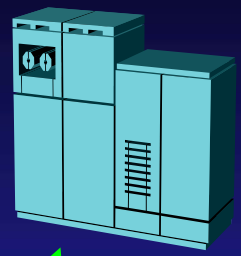


Source: Newsweek, December 2000

INTERACTION NETWORKS

Non Human Agent to
Non Human Agent
Communication





Non Human Agent
(webbots, avatars, databases,
"push" technologies)
To Human Agent

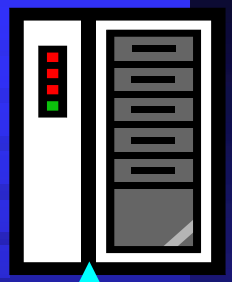
Publishing to
knowledge repository

Retrieving from
knowledge repository

Human Agent to Human Agent
Communication

Source: Contractor, 2001

COGNITIVE KNOWLEDGE NETWORKS



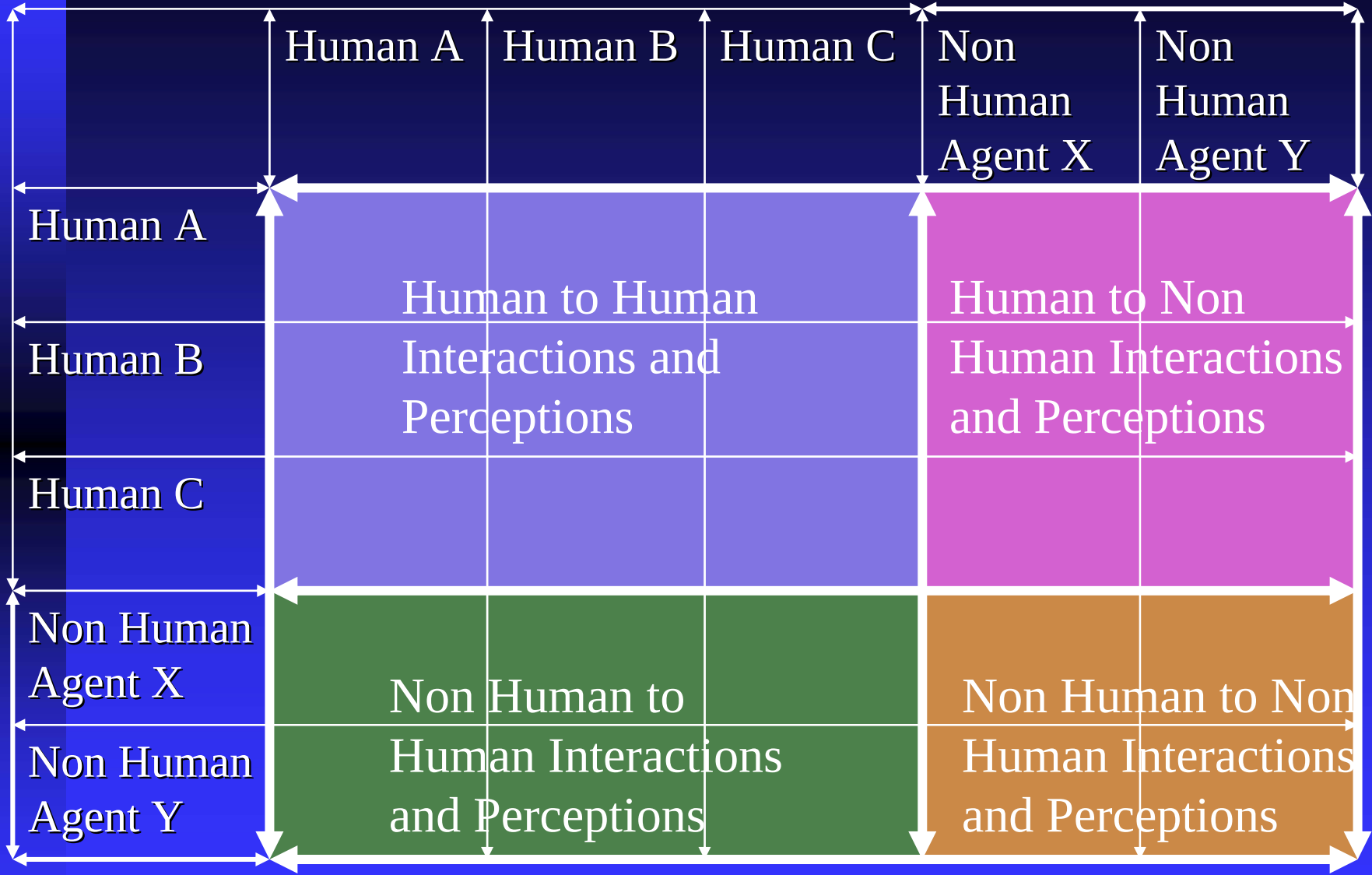
Non Human Agent's Perception of Resources in a Non Human Agent

Human Agent's Perception of Provision of Resources in a Non Human Agent

Non Human Agent's Perception of what a Human Agent knows *

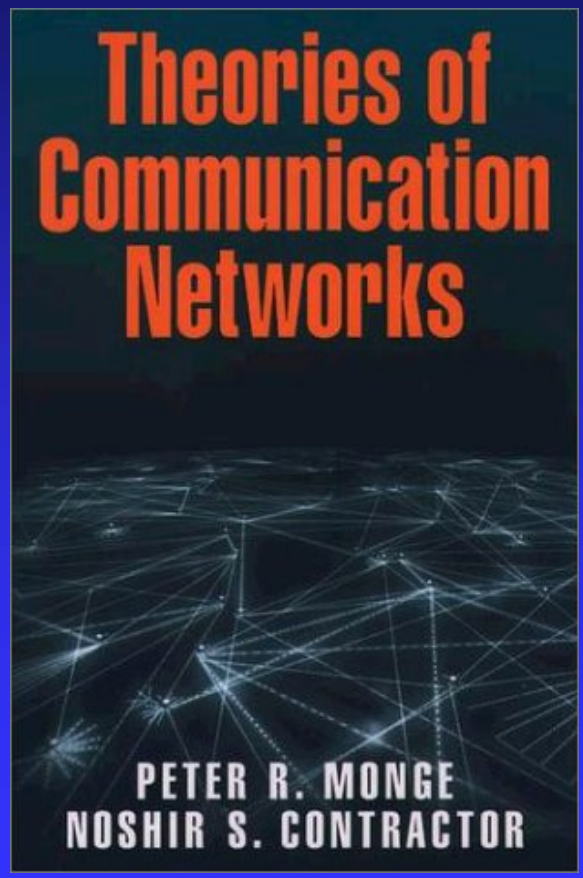
Human Agent's Perception of What Another Human Agent Knows

* *… Why Amazon thinks I am gay and Tivo thinks I am pregnant ….*


Human A
Human B
Human C
Non Human Agent X
Non Human Agent Y
Human A
Human B
Human C
Non Human Agent X
Non Human Agent Y
Human to Human Interactions and Perceptions
Human to Non Human Interactions and Perceptions
Non Human to Human Interactions and Perceptions
Non Human to Non Human Interactions and Perceptions

WHY DO WE CREATE, MAINTAIN, DISSOLVE, AND RECONSTITUTE OUR COMMUNICATION AND KNOWLEDGE NETWORKS?

Monge, P. R. & Contractor, N. S. (2003). Theories of Communication Networks. New York: Oxford University Press.



Why do actors create, maintain, dissolve, and reconstitute network links?

- Theories of self-interest
- Theories of social and resource exchange
- Theories of mutual interest and collective action
- Theories of contagion
- Theories of balance
- Theories of homophily
- Theories of proximity
- Theories of co-evolution

Sources:

Monge, P. R. & Contractor, N. S. (2003). Theories of Communication Networks. New York: Oxford University Press.

Contractor, N. S., Wasserman, S. & Faust, K. (in press). Testing multi-theoretical multilevel hypotheses about organizational networks: An analytic framework and empirical example. Academy of Management Review.

SONIC Projects Investigating Social Drivers for Online Communities

Science Applications

CLEANER: Collaborative Large Engineering & Analysis Network for Environmental Research (NSF)

CP2R: Collaboration for Preparedness, Response & Recovery

TSEEN: Tobacco Surveillance Evaluation & Epidemiology Network (NSF, NIH, CDC)

Business Applications

PackEdge Community of Practice (P&G)

Vodafone-Ericsson "Club" for virtual supply chain management (Vodafone)

Core Research

Social Drivers for Creating and Sustaining Online Communities

Societal Justice Applications

Cultural & Networks Assets In Immigrant Communities (Rockefeller Program on Culture & Creativity)

Economic Resilience NGO Community (Rockefeller Program Working Communities

Entertainment Applications

World of Warcraft (NSF)

Everquest (NSF, Sony Online Entertainment)

Social Drivers: Why do we create and sustain online communities?

- Theories of self-interest
- Theories of social and resource exchange
- Theories of mutual interest and collective action
- Theories of contagion
- Theories of balance
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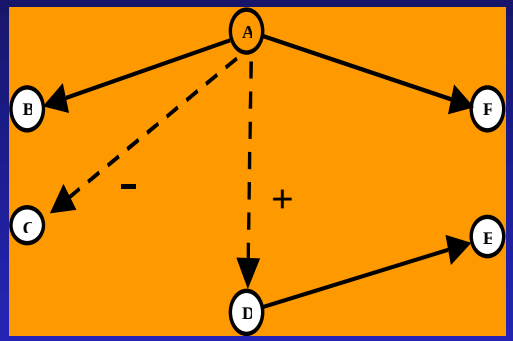
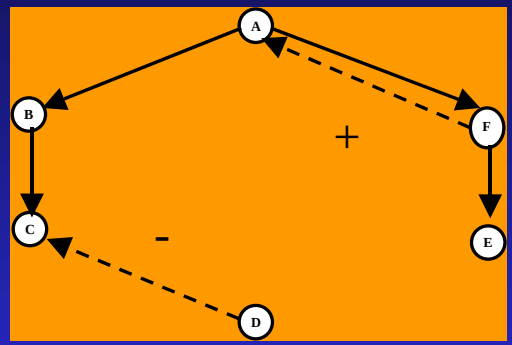
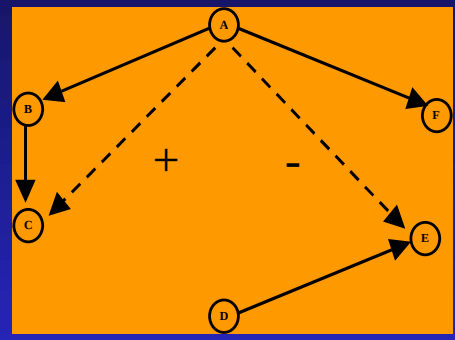
“Structural signatures” of Social Drivers



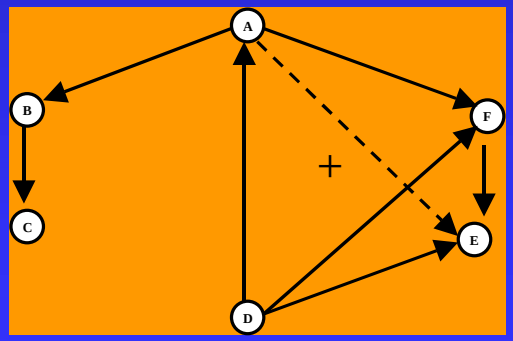
Theories of Self interest



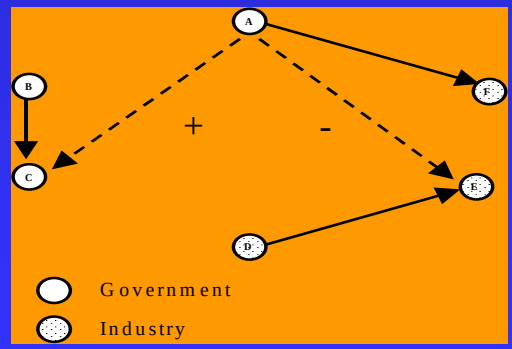
Theories of Exchange



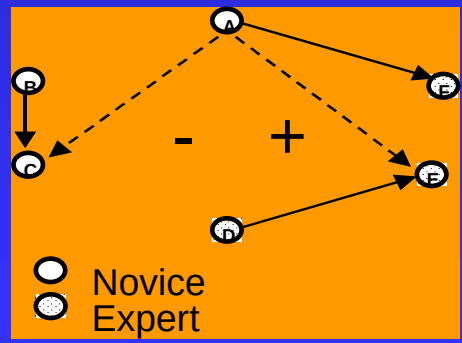
Theories of Balance



Theories of Collective Action



Theories of Homophily



Theories of cognition

A contextual "meta-theory" of social drivers for creating and sustaining online communities

	Exploring	Exploiting	Mobilizing	Bonding	Swarming
Theories of Self-Interest	+		--		
Theories of Collective Action		+	+		+
Theories of Cognition	+	+			+
Theories of Balance	--		+	+	
Theories of Exchange		+		+	
Theories of Contagion	+		+		
Theories of Homophily	--			+	
Theories of Proximity	--			+	+

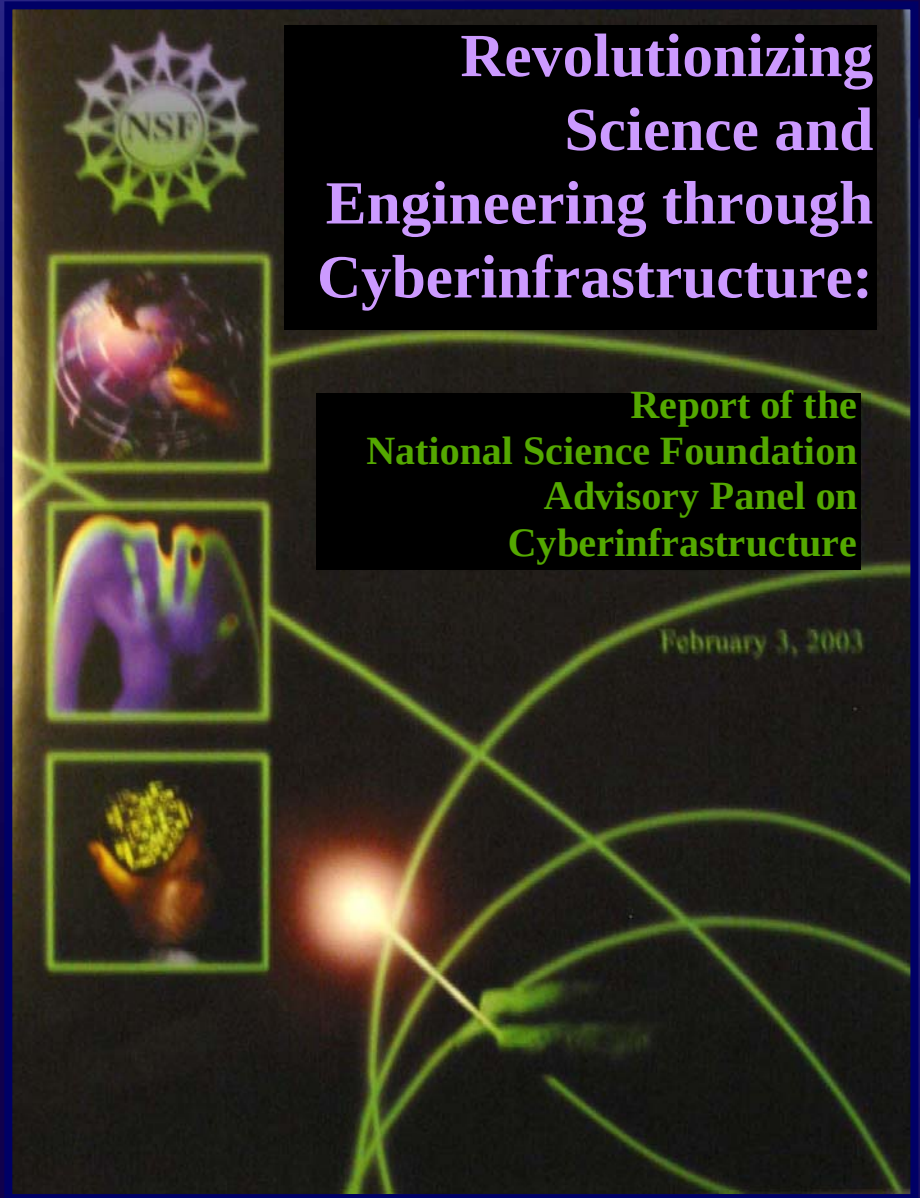
Challenges of empirically testing, extending, and exploring theories about online communities … until now

Enter: Cyberinfrastructure & Web 2.0

- Cyberinfrastructure and Web 2.0 are doing for *creating and sustaining community* what the Web browser did for *retrieving information* from the Internet.

- Cyberinfrastructure and Web 2.0 are doing for studying the *creating and sustaining community* what the Web browser did for studying the *retrieving information* (e.g., “click stream”) from the Internet.

The Atkins Report

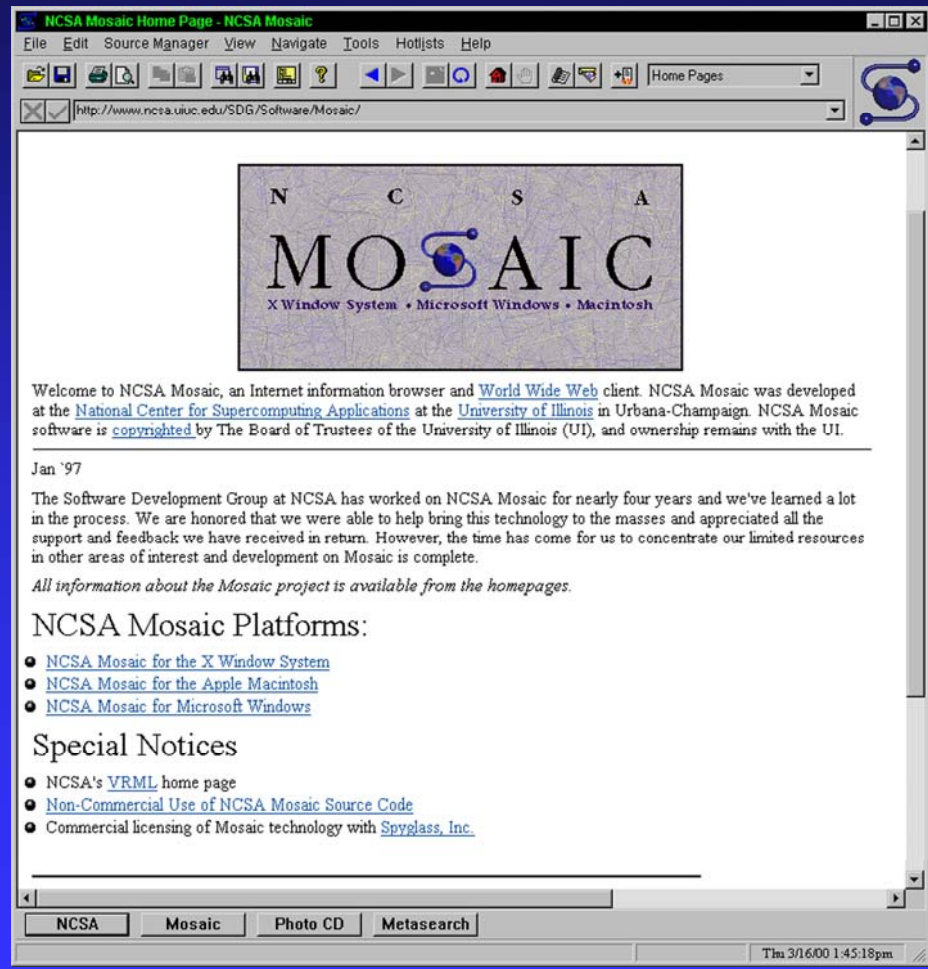


Daniel E. Atkins, Chair, University of Michigan
Kelvin K. Droegemeier, University of Oklahoma
Stuart I. Feldman, IBM
Hector Garcia-Molina, Stanford University
Michael L. Klein, University of Pennsylvania
David G. Messerschmitt, University of California at Berkeley
Paul Messina, California Institute of Technology
Jeremiah P. Ostriker, Princeton University
Margaret H. Wright, New York University

http://www.communitytechnology.org/nsf_ci_report/

From Mosaic to Cyberinfrastructure

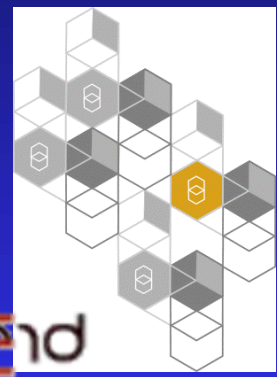
- Mosaic
  - By early 1990s, the internet had a wealth of resources, but they were inaccessible to most people
  - *Mosaic* facilitated the ***access*** of the Internet by ***all***

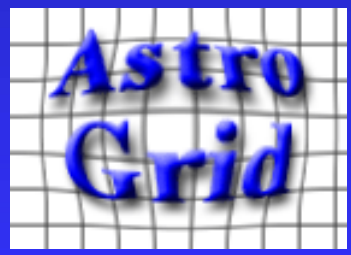


- Cyberinfrastructure
  - *Cyberinfrastructure* will facilitate the ***seamless and interconnected use*** of all the digital resources on the Internet (datasets, documents, sensors, analytics, computing, and communication)

For more information on NCSA's history, see: http://www.ncsa.uiuc.edu/20years/

Science and Engineering Cyberinfrastructures





CLEANER Cybercommunity

Collaborative
Large-Scale
Engineering
Analysis
Network for
Environmental
Research

The first cybercommunity implementing CI-KNOW

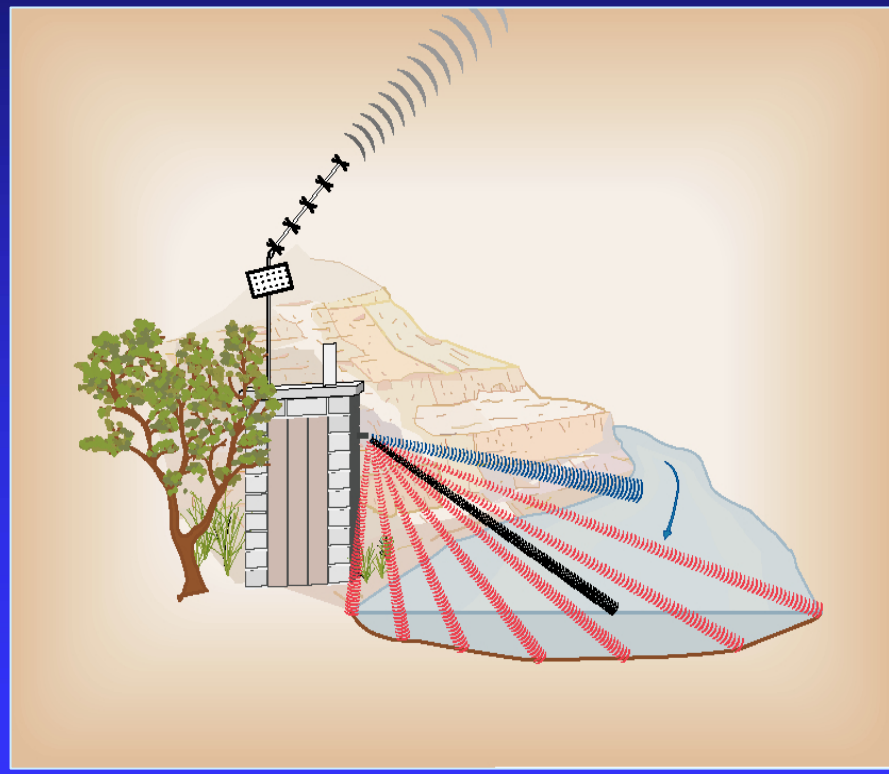
http://cleaner.ncsa.uiuc.edu/

CLEANER
Collaborative Large-Scale Engineering Analysis Network for Environmental Research

CUAHSI
The Consortium of Universities for Advancement of Hydrologic Science, Incorporated

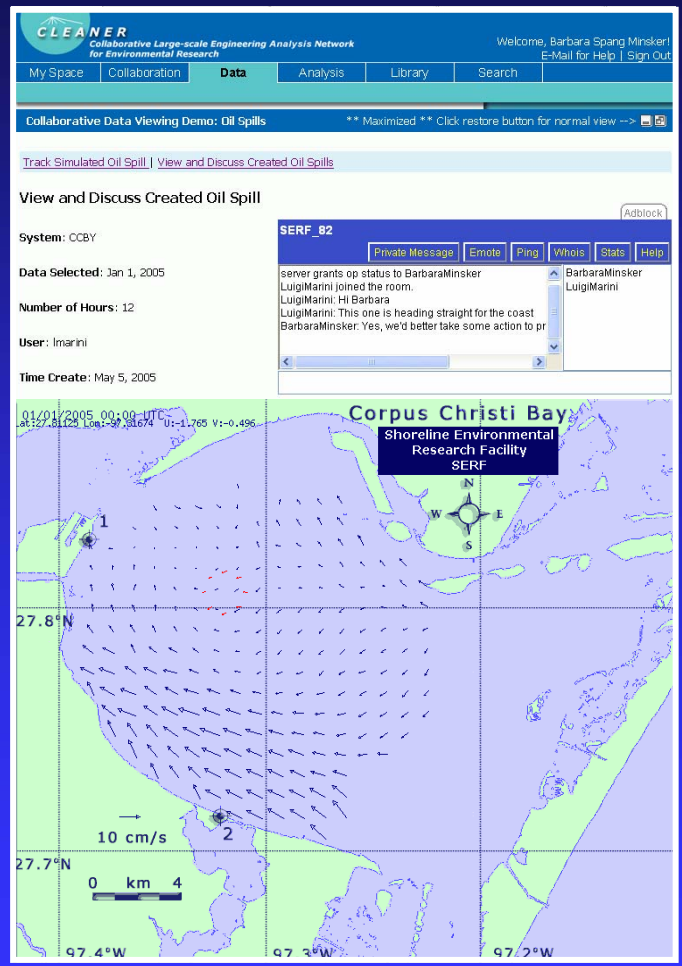
CLEANER Grand Challenge

1. *How do we detect and predict waterborne hazards in real time?*
2. *How do we predict the effects of human activities on the quantity, distribution, and quality of water?*
3. *How do we improve water cycle engineering management strategies to provide water quantity and quality to sustain humans and ecosystems?*



Enabling Environmental Engineering Communities with Cyberinfrastructure

- CLEANER
  Collaborative Large-scale Engineering Analysis Network for Environmental Research
  - Human-dominated, complex environmental systems, *e.g.*,
    - River basins
    - Coastal margins
  - What researchers requested:
    - Access to "live" and archived sensor data
    - Customized network referrals to people, documents, datasets
    - Analyze, visualize and compare data
    - Organize, automate and share cyber-research processes



Users can simultaneously view and discuss data and analyses

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Home | Knowledge | Data | Workflow | Collaboration | Library

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WATERS Network
Cyberinfrastructure Demo

The **WATERS CyberCollaboratory** is a collaborative environment in which scientists, educators, and practitioners can acquire, share, and talk about data and events related to the environment. Within this system, there are numerous analytical and communication services available for your use, click the icons below for details.

Knowledge Services | Data Services | Workflow Services | Collaboration Services | Library Services | Customization Services

About the Cyberinfrastructure Demo (CI-Demo)

The CI-Demo workspace is just one of several communities hosted by the CyberCollaboratory. Other communities include the Neuse River Community, Coast Margin Community, and the CLEANER Project Office Community. Each of these communities has their own unique interface and collection of tools for collaboration, data analysis, document management, etc.

The CI-Demo community provides the general public with a peek at the tools employed by these communities and, in doing so, allows users to see the variety of environmental engineering research and collaboration occurring within the CyberCollaboratory. By clicking on the icons above, you will receive an orientation to some of these tools and you may access each of these tools through the menus in the banner at the top of the page.

The WATERS CyberCollaboratory is hosted by National Center for Supercomputing Applications at the University of Illinois.

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CI-KNOW recommends you learn more about Chaitan Baru.

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- f. Document Library
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- h. Web Crawled Documents
- i. CCRay Data Sharing Demo

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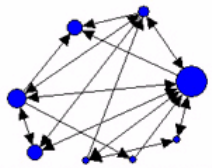
Knowledge Services

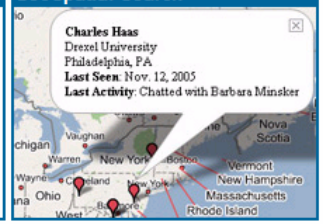
Knowledge services help scientists and engineers find information from disbursed sources such as data and document archives, meta-workflows, discussion boards, social networks, etc.

CI-KNOW

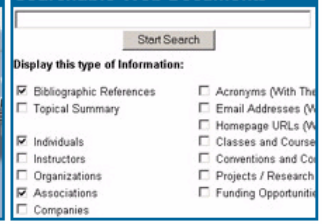


Recommends users, services, and documents based on your actions

GeoSpatial Search



Searchable Web Documents



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e. Chat
f. Document Library
g. Search
h. Web Crawled Documents
i. CCBay Data Sharing Demo
j. CUAHSI Hydrological Data Access

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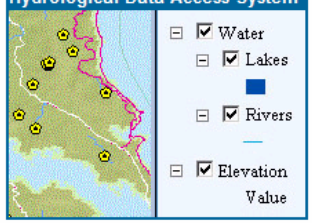
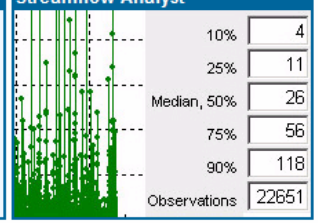
Data Services

Data services make available public data sources and tools for use in conducting workflow analysis and collaboration activities. Please note, the current version of HDAS does not work in Firefox.

Hydrological Data Access System



Streamflow Analyst



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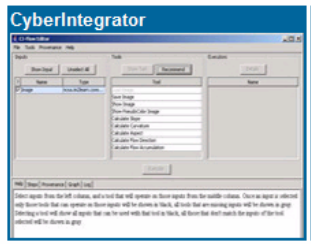
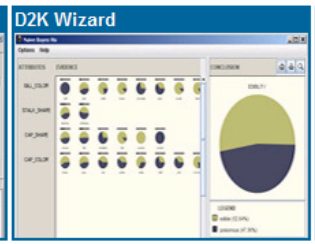
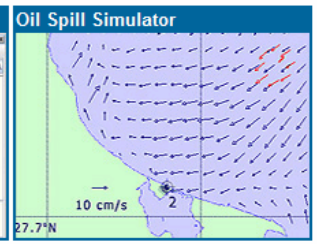
Workflow & Model Services

Workflow and model services execute a sequence of tasks on one or more machines/servers to filter data, perform analyses, and visualize information.







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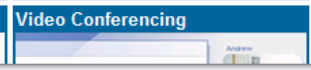
Knowledge Services | Data Services | Workflow Services | Collaboration Services | Library Services | Customization Services

Collaboration Services

The WATERS CyberCollaboratory hosts a variety of collaboration services. These include asynchronous tools such as Wikis, Discussion Boards, and User Notebooks as well as real time services including Multipoint Video Conferencing and Chat Rooms.



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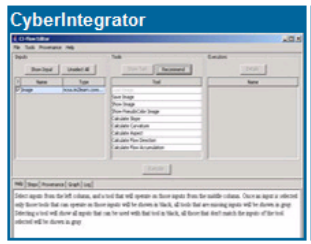

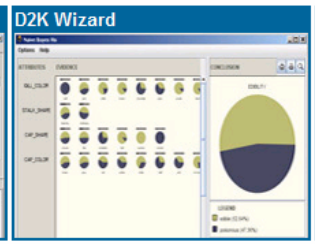

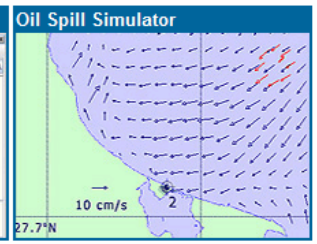

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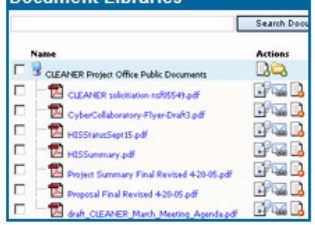
Library Services

The CyberCollaboratory supports a collection of library and document management services. Among them are: Document Libraries, Community News Blogs, and RSS Feeds.

Document Libraries



News Of Today (RSS)

U.S. EPA Toxic Chemicals and Pesti

EPA Issues Approval to Dispose of PCB
Tuesday, February 14, 2006 10:00:01 PM CST EP

EPA Offers Aid for Community Projects
Monday, February 13, 2006 10:00:01 PM CST EP

EPA Offers $2.7M to Reduce Risks of T
Thursday, February 9, 2006 10:00:01 PM CST EP

EPA Posts Additional Results from Samp
Thursday, February 9, 2006 10:00:01 PM CST EP

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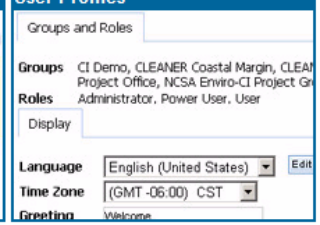
Customization Services

To customize your experiences, the CyberCollaboratory provides a variety of customization features. Users may belong to one of the multiple communities and they can easily customize their interfaces and profile information. Last, users can make use of the CyberDashboard to continuously monitor activity within the CyberCollaboratory.

Multiple Communities

CyberDashboard

User Profiles



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Logo 2.0

Source: http://flickr.com/photos/stabilo-boss/101793494/

Its all about “Relational Metadata”

- Technologies that “***capture***” communities’ relational meta-data (Pingback and trackback in interblog networks, blogrolls, data provenance)
- Technologies to “***tag***” communities’ relational metadata (from Dublin Core taxonomies to folksonomies (‘wisdom of crowds’) like
  - Tagging pictures (Flickr)
  - Social bookmarking (del.icio.us, LookupThis, BlinkList,
  - Social citations (CiteULike.org)
  - Social libraries (discogs.com, LibraryThing.com)
  - Social shopping (SwagRoll, Kaboodle, thethingsiwant.com)
  - Social networks (FOAF, XFN, MySpace, Facebook)
- Technologies to “***manifest***” communities’ relational metadata (Tagclouds, Recommender systems, Rating/Reputation systems, ISI’s HistCite, Network Visualization systems)

Multidimensional Networks in CI (Cyberinfrastructure)
Multiple Types of Nodes and Multiple Types of Relationships

CLEANER Community: A multidimensional network

Are we CI-Ready?

Social "Petworking" – Reported in Wired, April 11, 2005

SNIF: Social Networking in Fur

Group: Noah Fields, Jonathan Gips, Philip Liang, Arnaud Pilpré

What

We present a system that allows pet owners to interact through their pets' social networks. Inexpensive, unobtrusive hardware can be affixed to pet collars and paraphernalia in order to augment pet-to-pet, pet-to-owner, and owner-to-owner interactions. SNIF devices aggregate pertinent environmental, social, and individual information that can be broadcast or addressed to other participating community members.

Why

Pets already function as social devices. Walking a dog in the park can lead to conversations that one might not otherwise have. Pets function as active icebreakers that will go up to anyone without any notion of social inhibition. Furthermore, pet-owners love buying products for their pets: sweaters, leashes, collars, toys, dishes, and beds. These items provide a set of rich interactions that can be brought into the digital world.

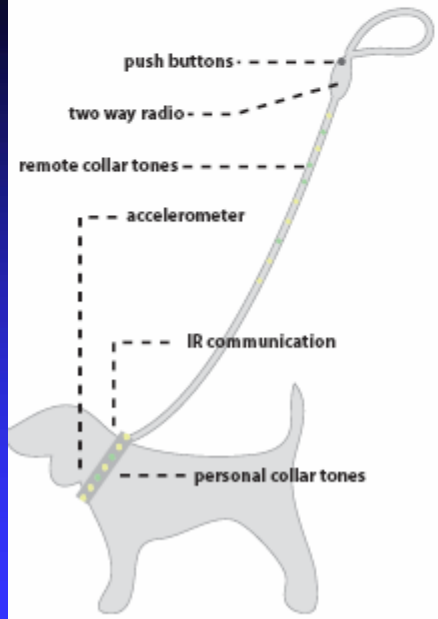
How

The SNIF starter kit includes a leash and collar as well as membership in the online community.

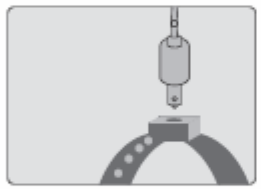
SNIF collars contain an LED display, an IR transceiver, and various sensors such as accelerometers and digital thermometers. They function as output devices that display personalized "collar tones" when the pet comes in proximity to another pet. They serve as input devices that sense activity levels, microclimate conditions, and other pets' presence.

The SNIF leash contains a two-way RF device, such as the Ambient Devices platform, and serves multiple purposes in the SNIF system. When attached to a pet's collar, it can upload information from the collar to the SNIF servers. When disconnected, the leash functions as an ambient device that displays real-time information, which is streamed from the SNIF servers, relevant to the pet and pet owner. For example, the leash displays the "collar tones" of frequently encountered pets that are going out for a walk. It may also give an indication of the general pet-walking index.

The online community portion of SNIF allows pet-owners to set privacy preferences, communicate with other pet owners, arrange pet outings, and customize the ambient information that their SNIF leashes display.

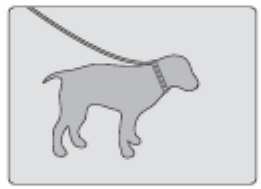


1. leash up



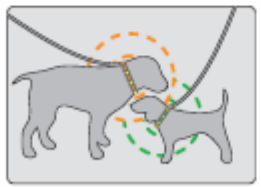
By connecting the leash to the collar, you signal the network that you are about to head out to play.

2. walk



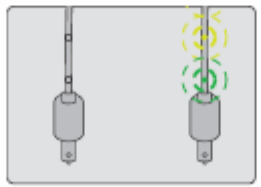
While you are on your walk, your collar keeps an eye out for your pals.

3.sniff



When you discover another dog, your collar displays a unique sequence of flashing lights, these are your collar tones. Your friend's collar tones flash on his collar.

4.friend!

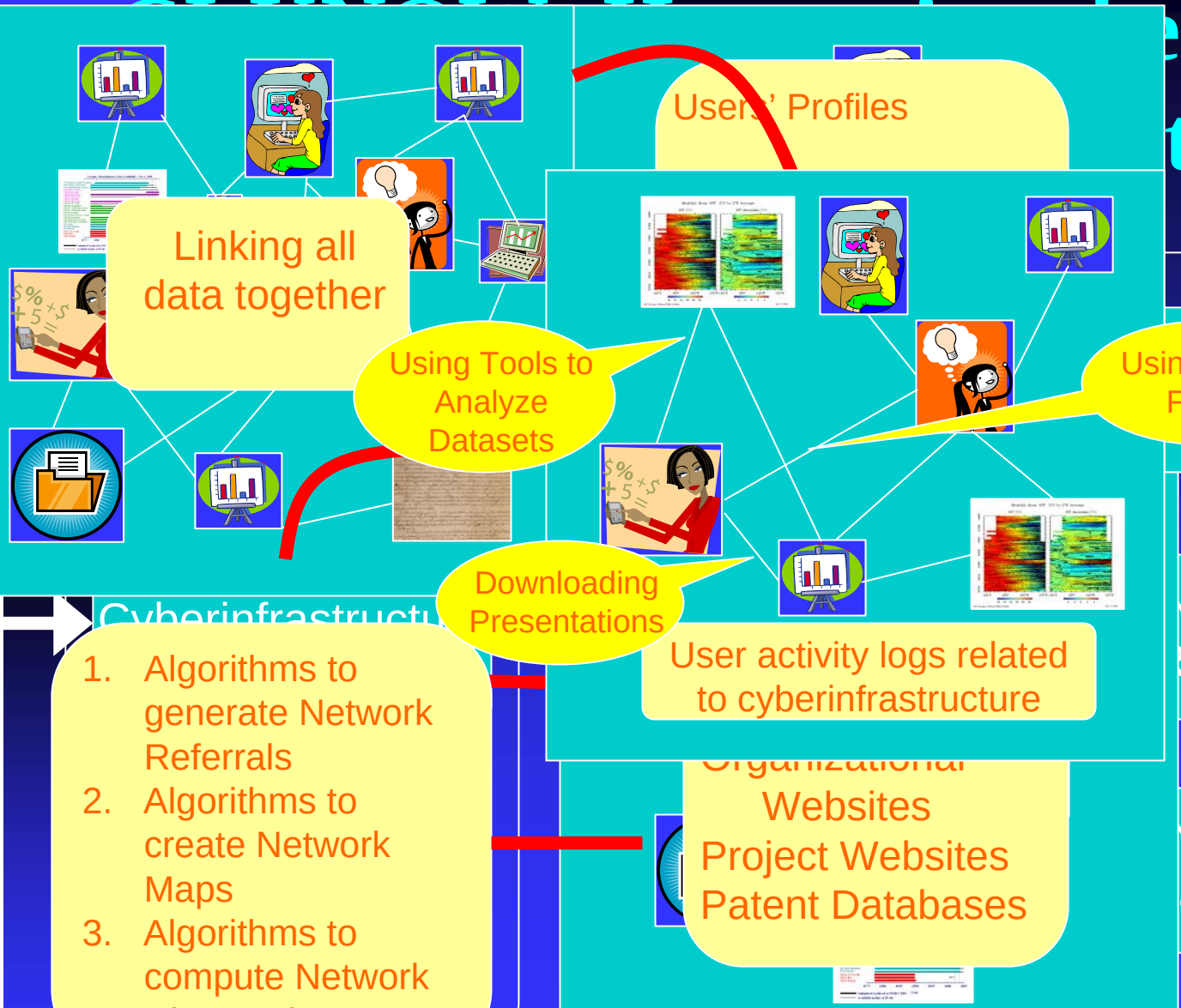


When you are back at your house, you can keep an eye on your companions. When one of your pals goes out to play, their collar tones are displayed on your leash!

Extensions

Pet toys that serve as tangible interfaces for the pet.
Degrees of separation between pets that changes as they interact.
Remote monitoring of pet's activity.
Local RF detection to display degrees of separation from the other pets in the vicinity.

online
ta-data



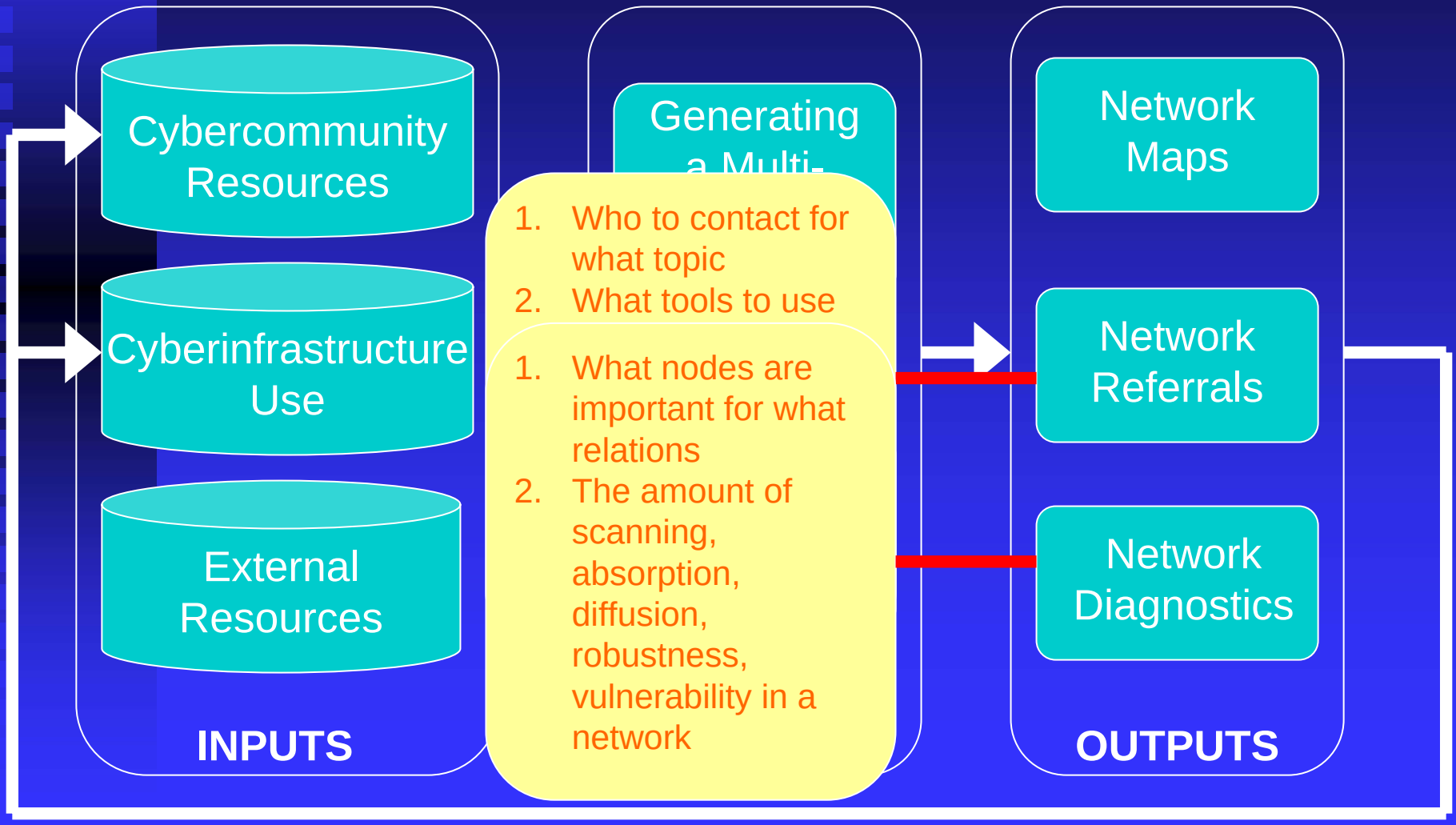
1. Algorithms to generate Network Referrals
2. Algorithms to create Network Maps
3. Algorithms to compute Network Diagnostics

Network Referrals

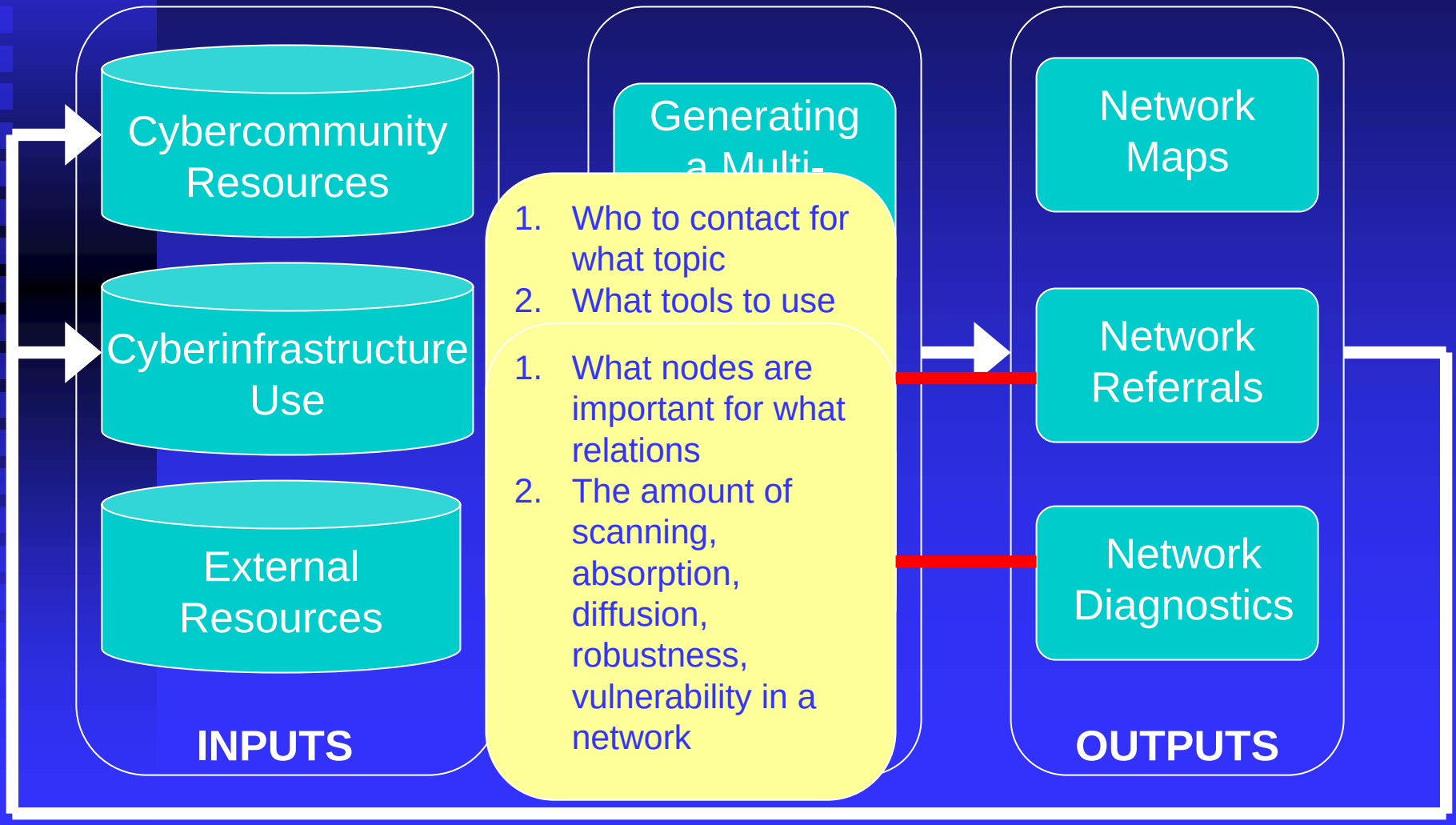
Network Diagnostics

UTPUTS

CI-KNOW: Harvesting the online community's relational meta-data



CI-KNOW: Harvesting the online community's relational meta-data



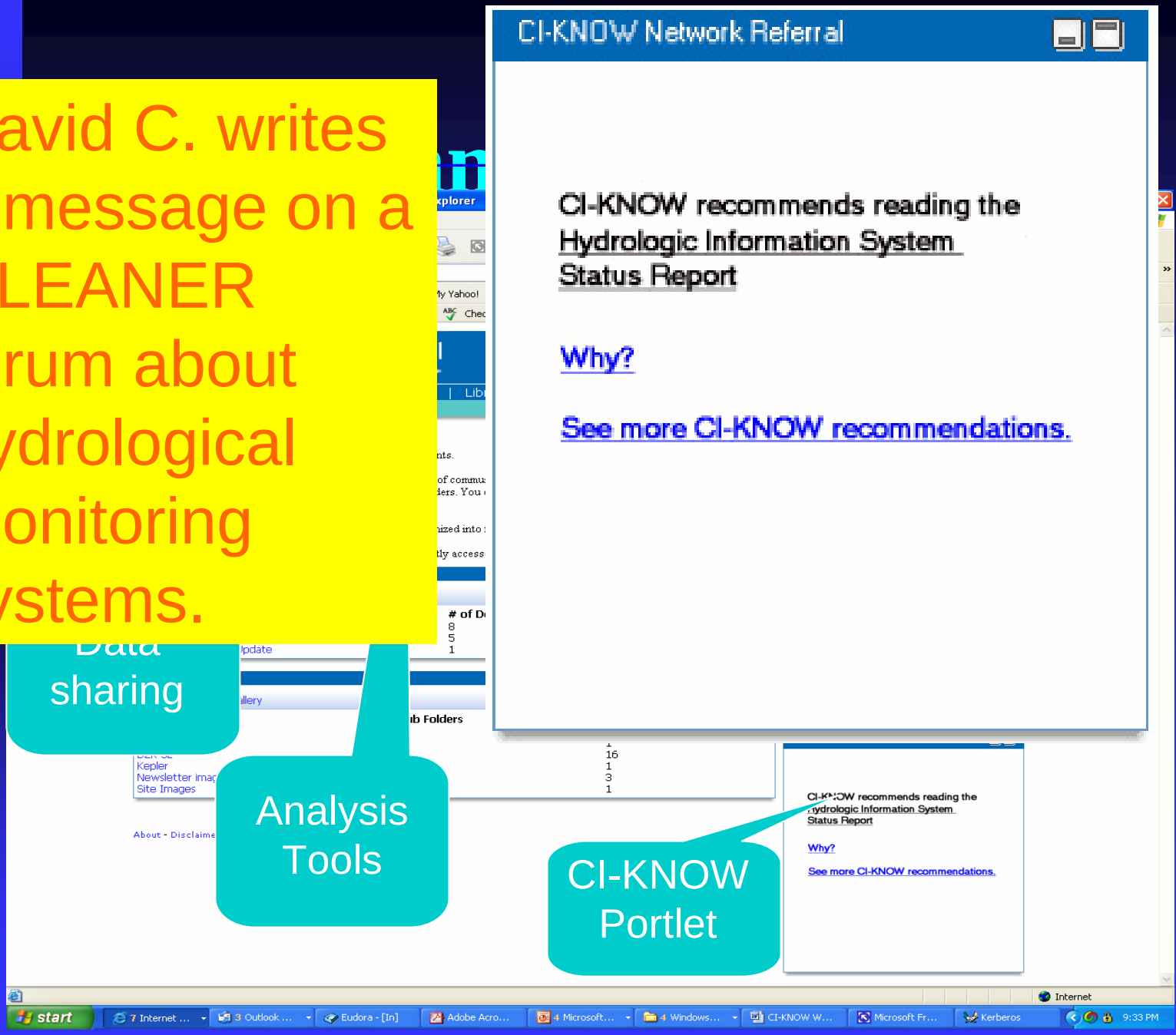
David C. writes a message on a CLEANER forum about hydrological monitoring systems.

Co

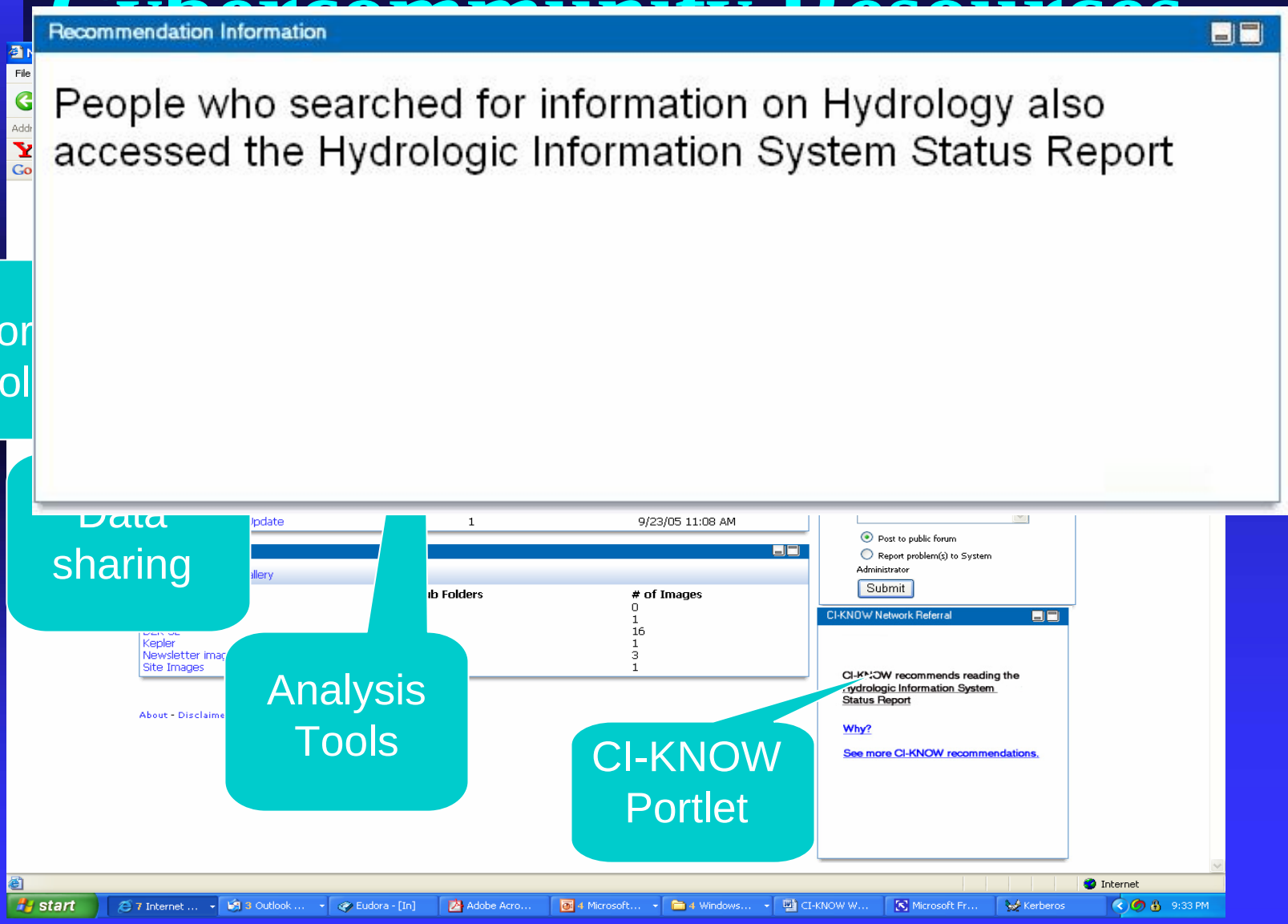
Data sharing

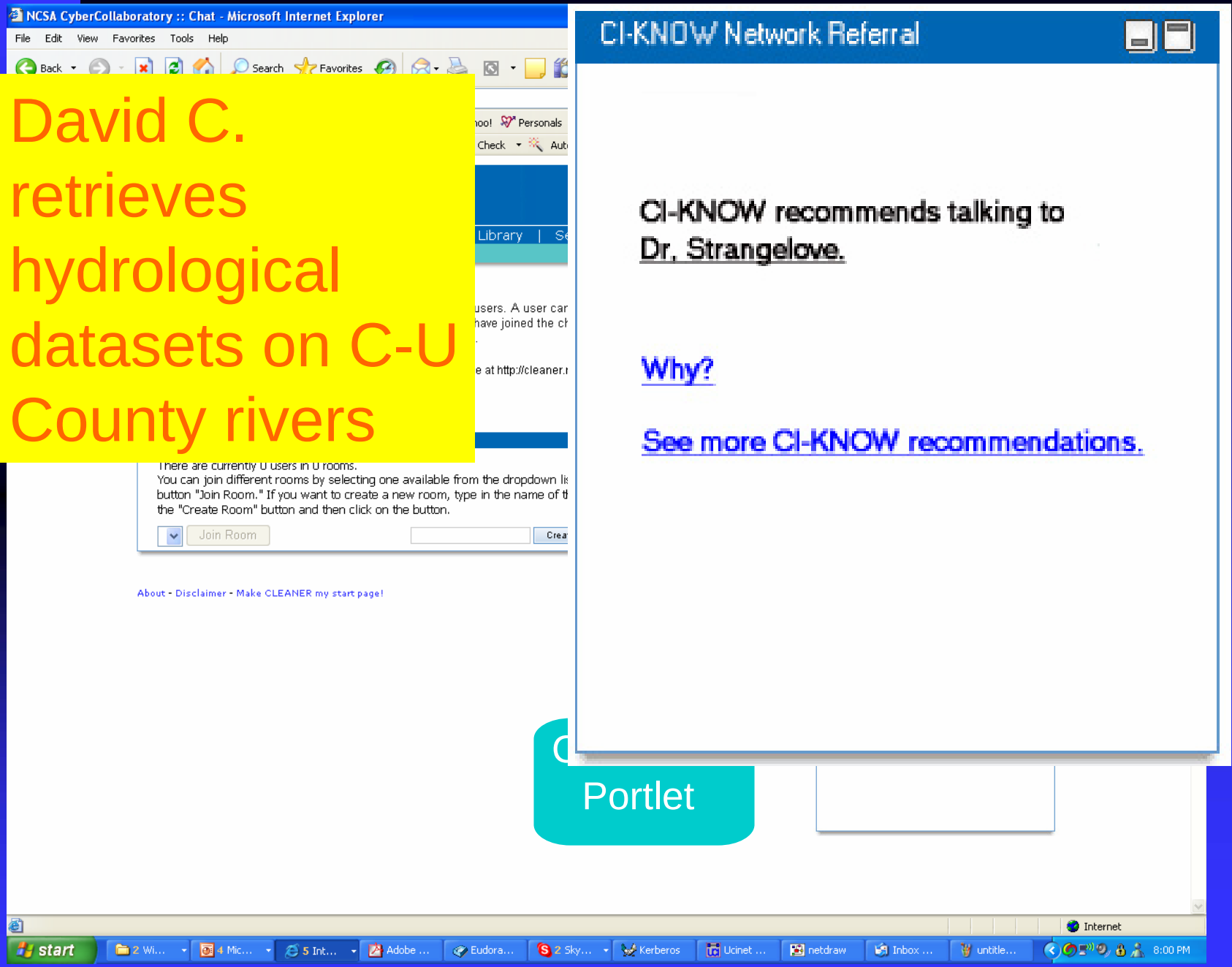
Analysis Tools

CI-KNOW Portlet

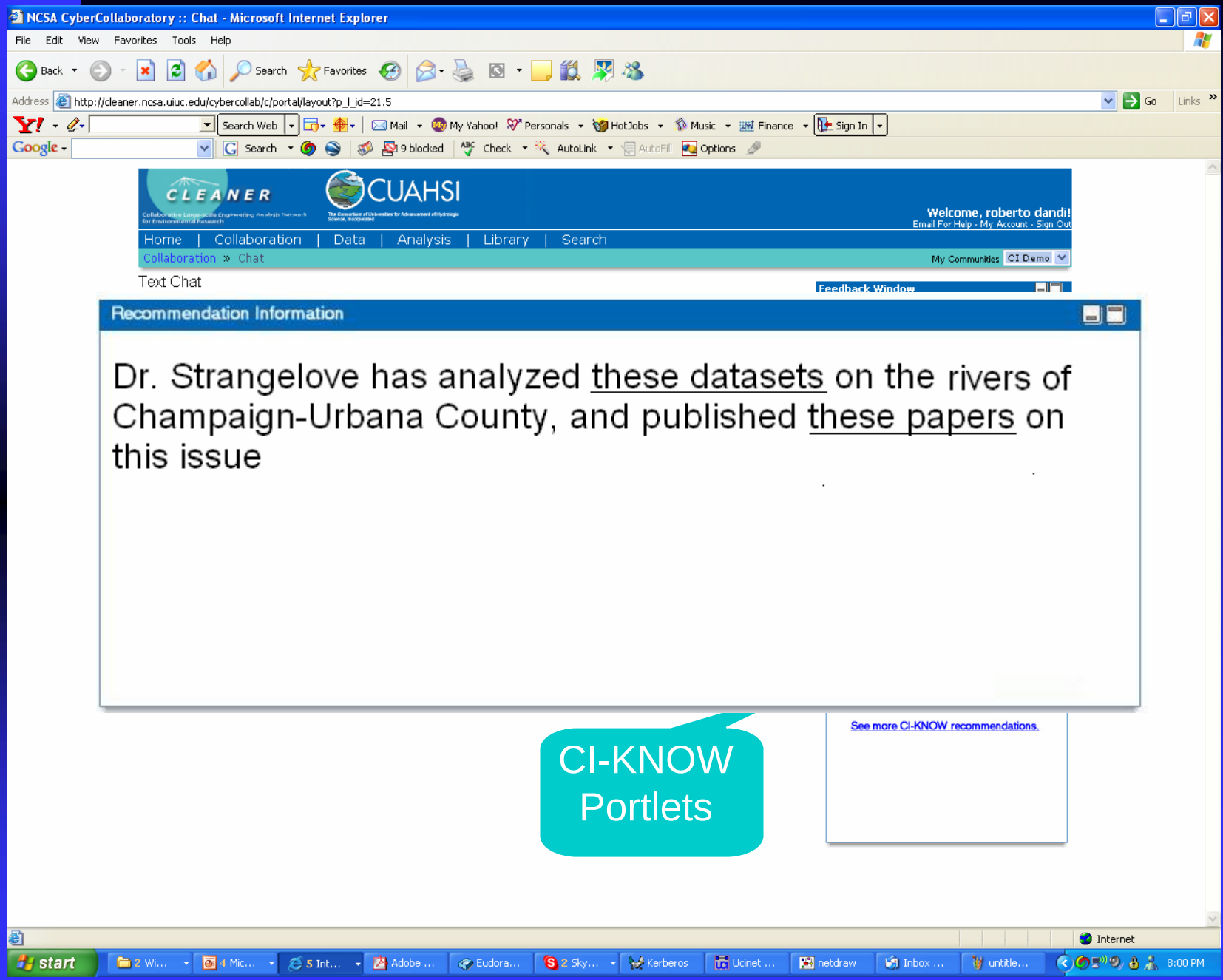


Cybercommunity Resources





David C. retrieves hydrological datasets on C-U County rivers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Recommendation Information
Dr. Strangelove has analyzed these datasets on the rivers of Champaign-Urbana County, and published these papers on this issue
See more CI-KNOW recommendations.
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SONIC Projects on Enabling Communities with Cyberinfrastructure

Science Applications

CLEANER: Collaborative Large Engineering & Analysis Network for Environmental Research (NSF)

CP2R: Collaboration for Preparedness, Response & Recovery

TSEEN: Tobacco Surveillance Evaluation & Epidemiology Network (NSF, NIH, CDC)

Business Applications

PackEdge Community of Practice (P&G)

Vodafone-Ericsson "Club" for virtual supply chain management (Vodafone)

Core Research

Social Drivers for Creating and Sustaining Online Communities

Societal Justice Applications

Cultural & Networks Assets In Immigrant Communities (Rockefeller Program on Culture & Creativity)

Economic Resilience NGO Community (Rockefeller Program Working Communities

Entertainment Applications

World of Warcraft (NSF)

Everquest (NSF, Sony Online Entertainment)

Tobacco Surveillance, Epidemiology, and Evaluation Network (TSEEN)

- National Cancer Institute
- Center for Disease Control's National Center for Health Statistics (NCHS),
- Center for Disease Control's Office of Smoking and Health (OSH),
- Agency for Healthcare Research and Quality (AHRQ),
- National Library of Medicine (NLM) and
- Non-government agencies such as the American Legacy Foundation.

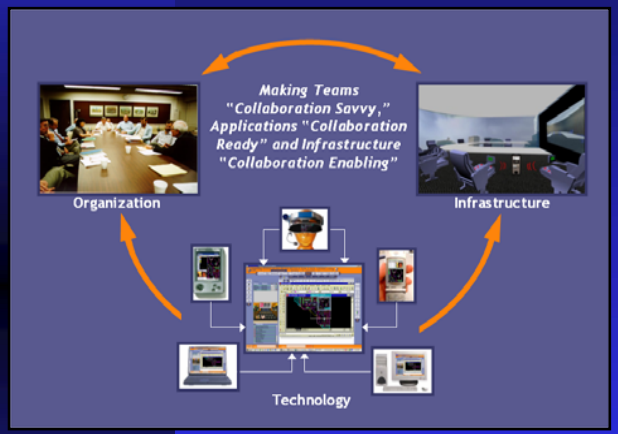
TSEEN Network Referral System

- Low-tar cigarettes cause more cancer than regular cigarettes …
- A pressing need for systems that will help the TSEEN members effectively connect with other individuals, data sets, analytic tools, instruments, sensors, documents, related to key concepts and issues

Network Map: Example based on prototype developed for Tobacco Surveillance Evaluation & Epidemiology Community

CP2R: ICT Support in Emergency Management Networks

Drawing Analogies from Natural Systems



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SONIC

Natural Communities: Ants & Honey Bees

ENTOMOLOGY: Learning from natural robust societies.

Successful systems (evolution time)

Ant - based models have successfully been applied to solve optimization [Dorigo, 1996; Botee, 1999] **and networking** [Bonabeau, 2000] **problems, among others.**

Bees' setting and objectives in foraging [Seeley, et al. 1991] resembles disaster relief response scenario (collective decision-making).

Problem: Information Overload

- Hundreds or Thousands of first responders operate sharing couple of voice channels (radio, cell-phones)
  [Domel, 2001]

http://www.hollandsentinel.com/images/031503/Borculofire4.jpg

- If technology provides a mean to enhance delivery and media of information, we envision this problem would increase

Information Overload: Ants

Analogy (Ants' alarm propagation)

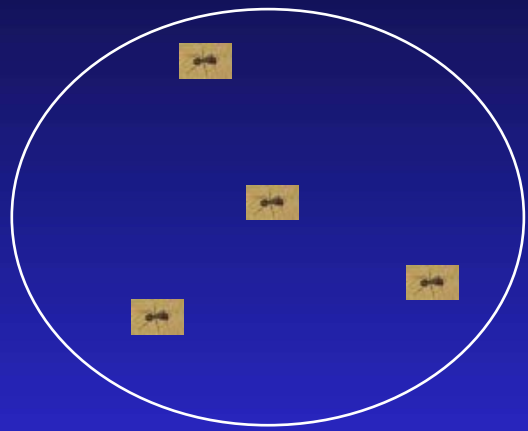
Division of Labor; each ant "has" a threshold for each stimulus (pheromone).

When stimulus is greater than threshold the ant will be on "alarm" mode.

Centels ants detects a hazard and release "alarm" pheromone (volatile).

Each pheromone release will last for a limited time; seconds or minutes.

The heterogeneous response to alarm pheromone avoids all ants react immediately (good or bad?).



H
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W

Idea:

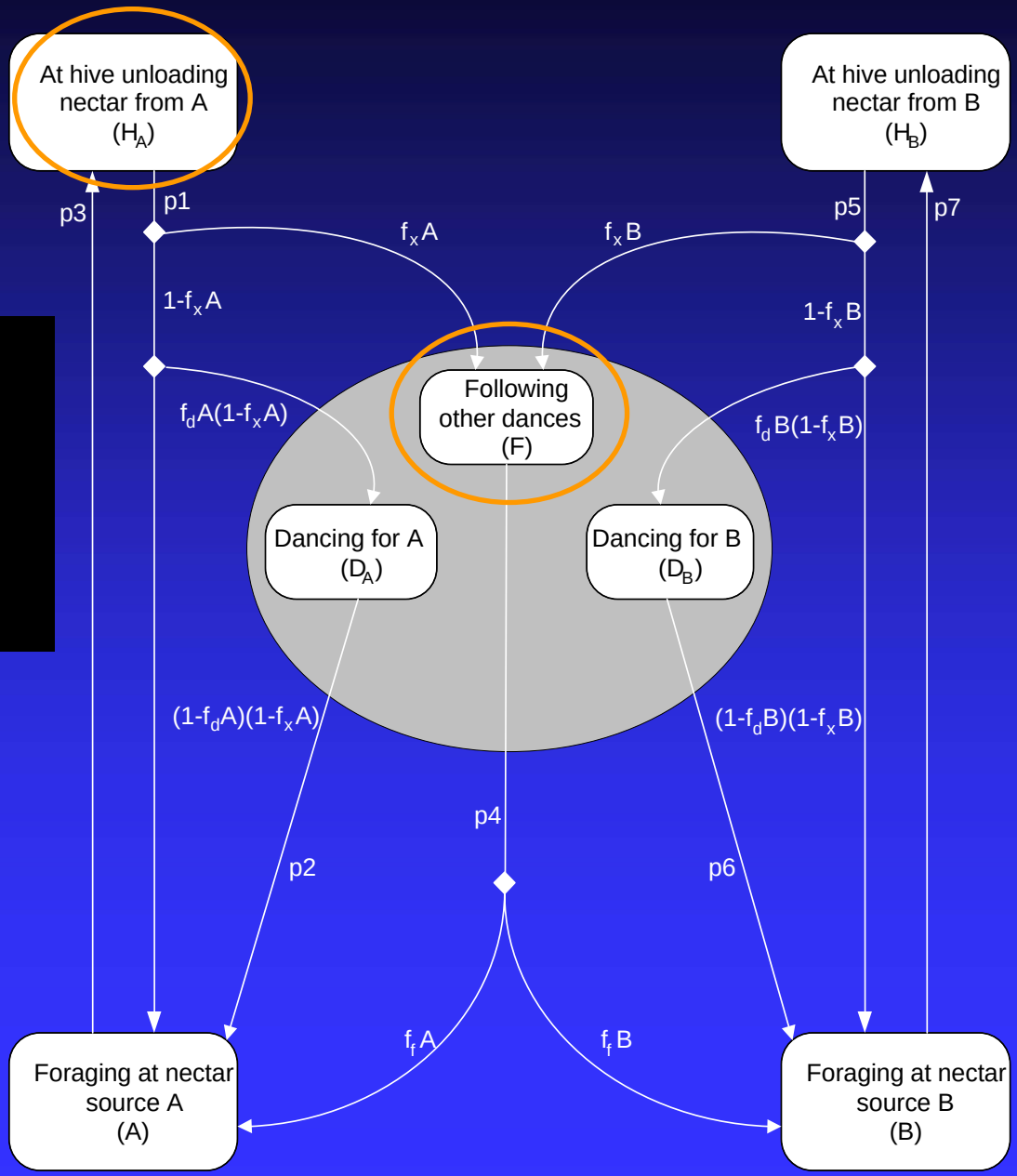
Actors will propagate information received only if the stimulus, i.e., "quality of information", is greater than his/her threshold for that type of information.

Avoiding cascading effect; controlling information overload.

SONIC

Natural Communities: Honey Bees

Honey Bees (*Apis melifera*)
Foraging Model [Seeley, 1991]



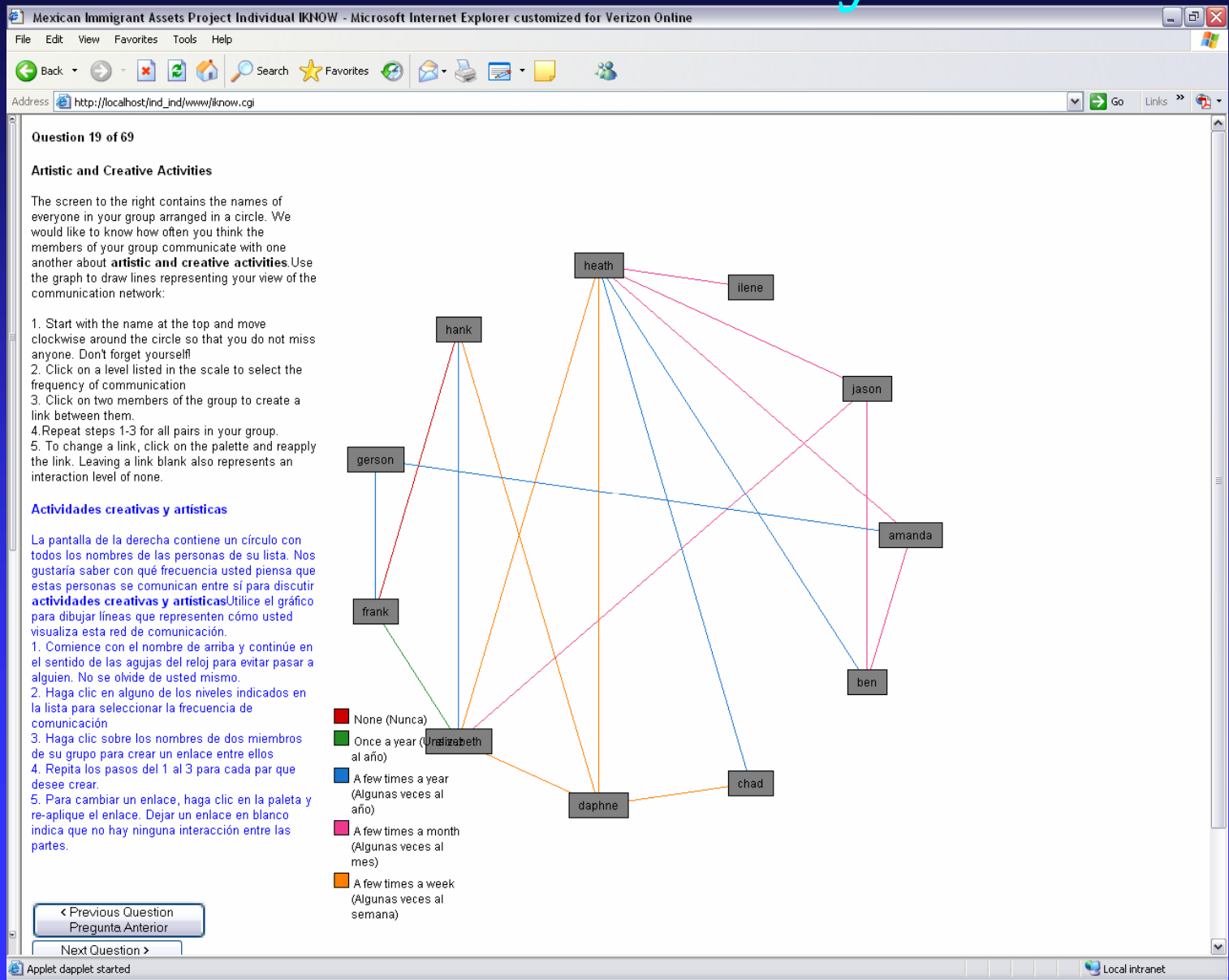
The system evaluates ALL the information, though individuals evaluate only partial information

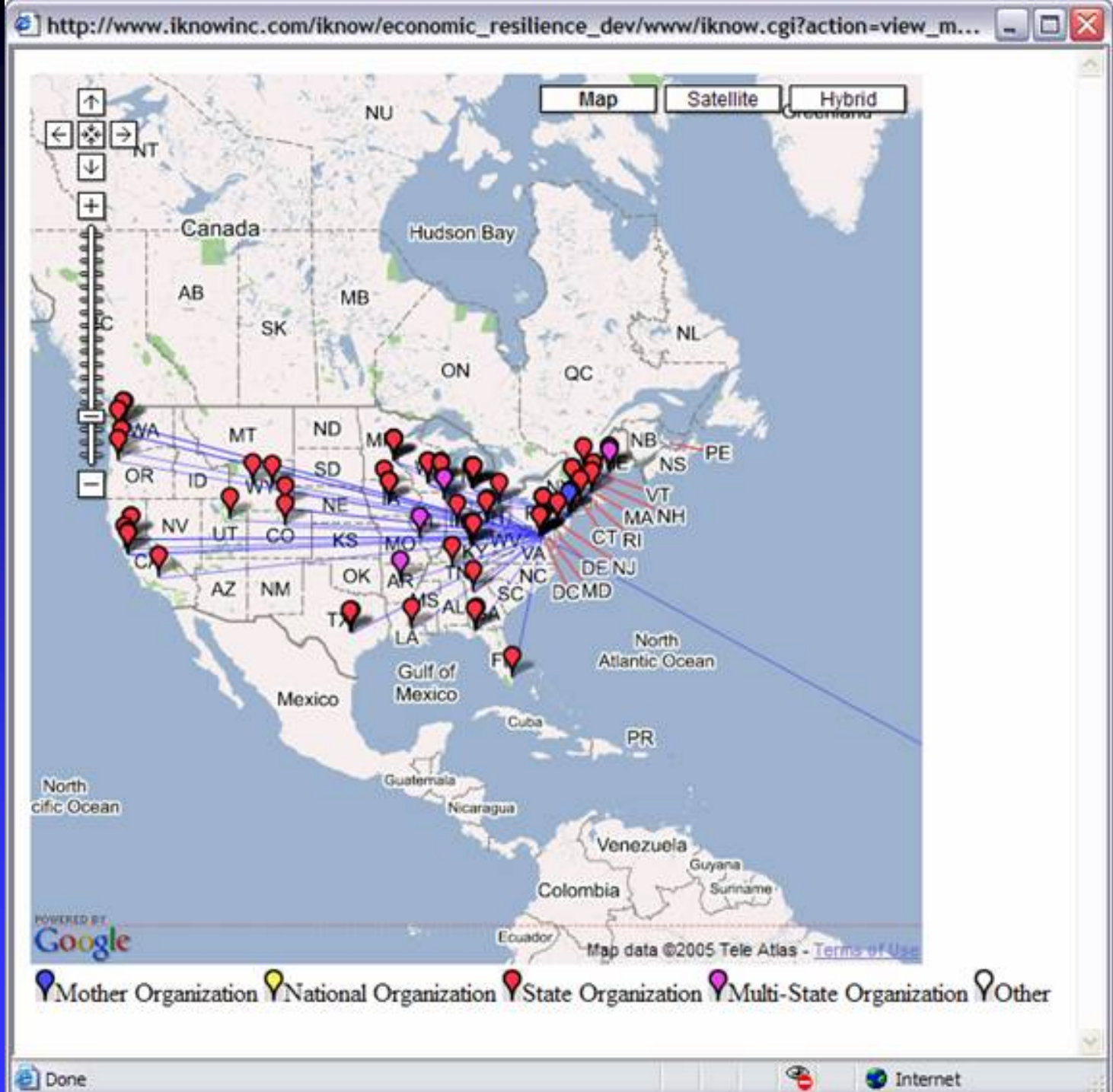
Mexican Immigrant Community Project Objectives

- **Identify** cultural, artistic, and networking capacities and assets of post-NAFTA Mexican immigrant community.
- **Analyze** how these capacities buffer challenges or obstacles faced by migrants as they traverse the transnational landscape.
- **Investigate** how cultural knowledge is distributed throughout transnational migrant community
- **Understand** new forms, new applications of existing forms, and emerging hybrids to explore community formation, community building strategies, and creative potential of migrants.

In partnership with the Center for Cultural Understanding & Change @

Ethnographers use Tablet PCs to learn from community members

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SK
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ND
OR
ID
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AL
LA
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Gulf of
Mexico
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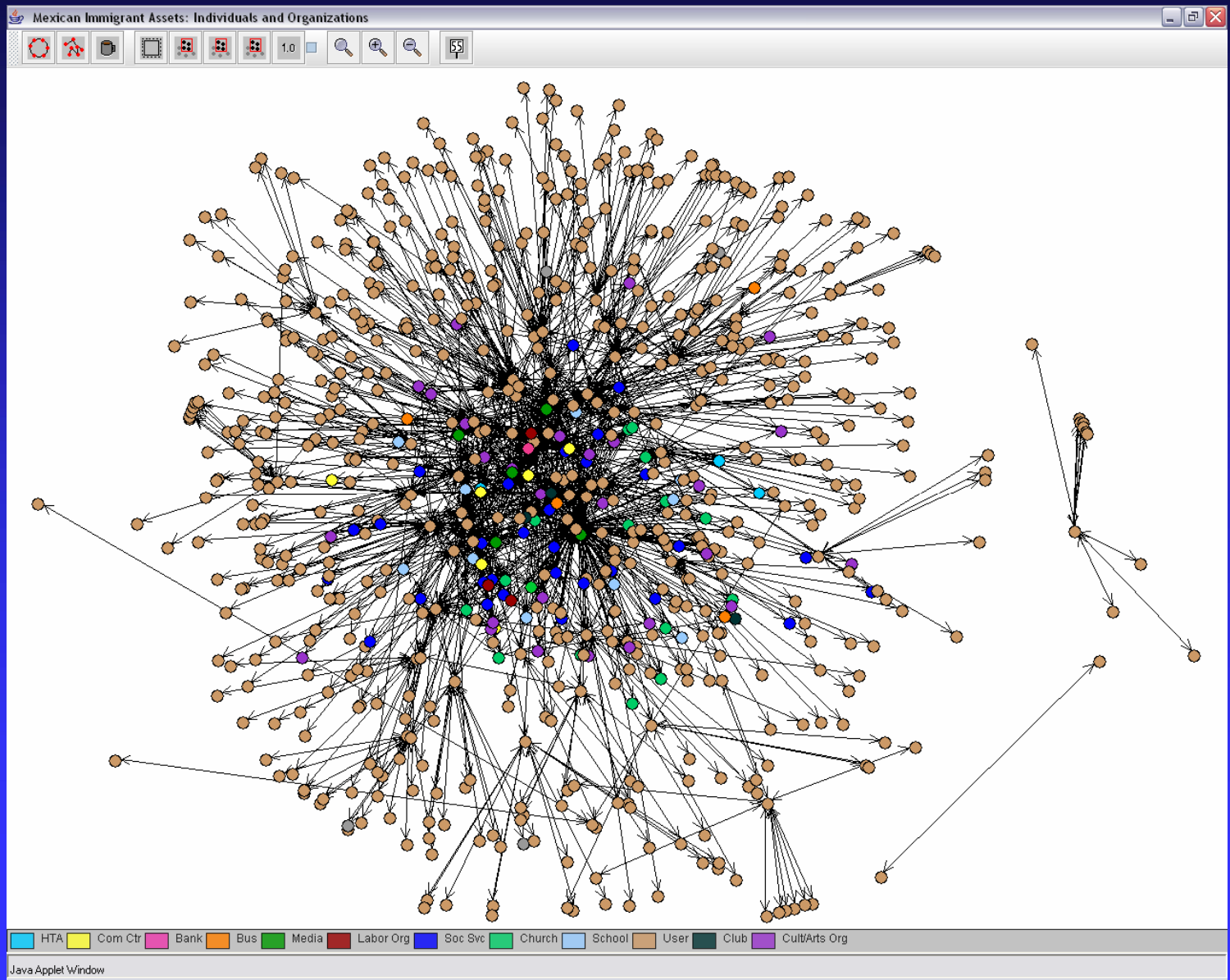
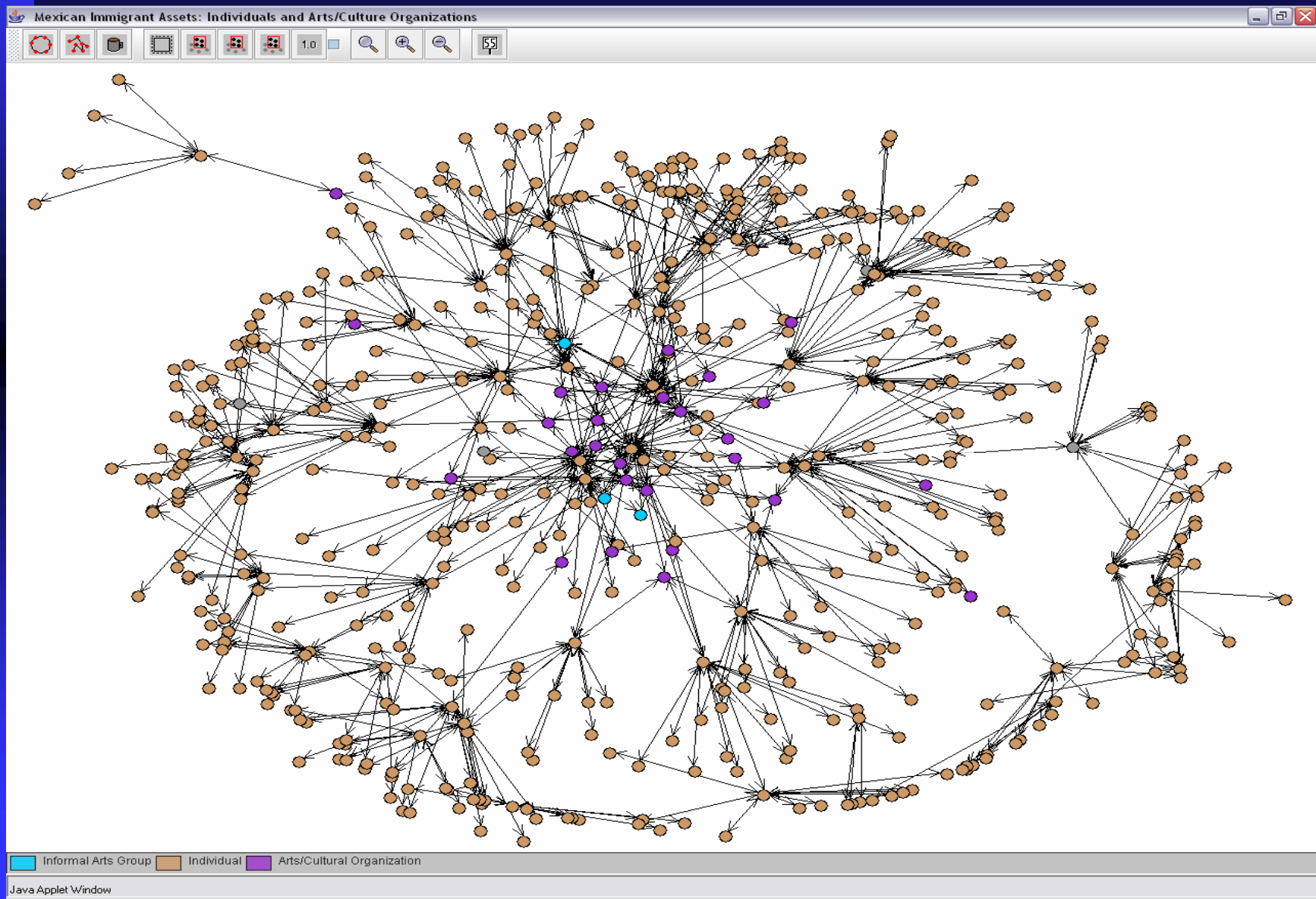
Cuba
PR
Guatemala
Nicaragua
Venezuela
Guyana
Suriname
Colombia
Ecuador
North
cific Ocean
Google
Map data ©2005 Tele Atlas - Terms of Use
Mother Organization
National Organization
State Organization
Multi-State Organization
Other
Done
Internet

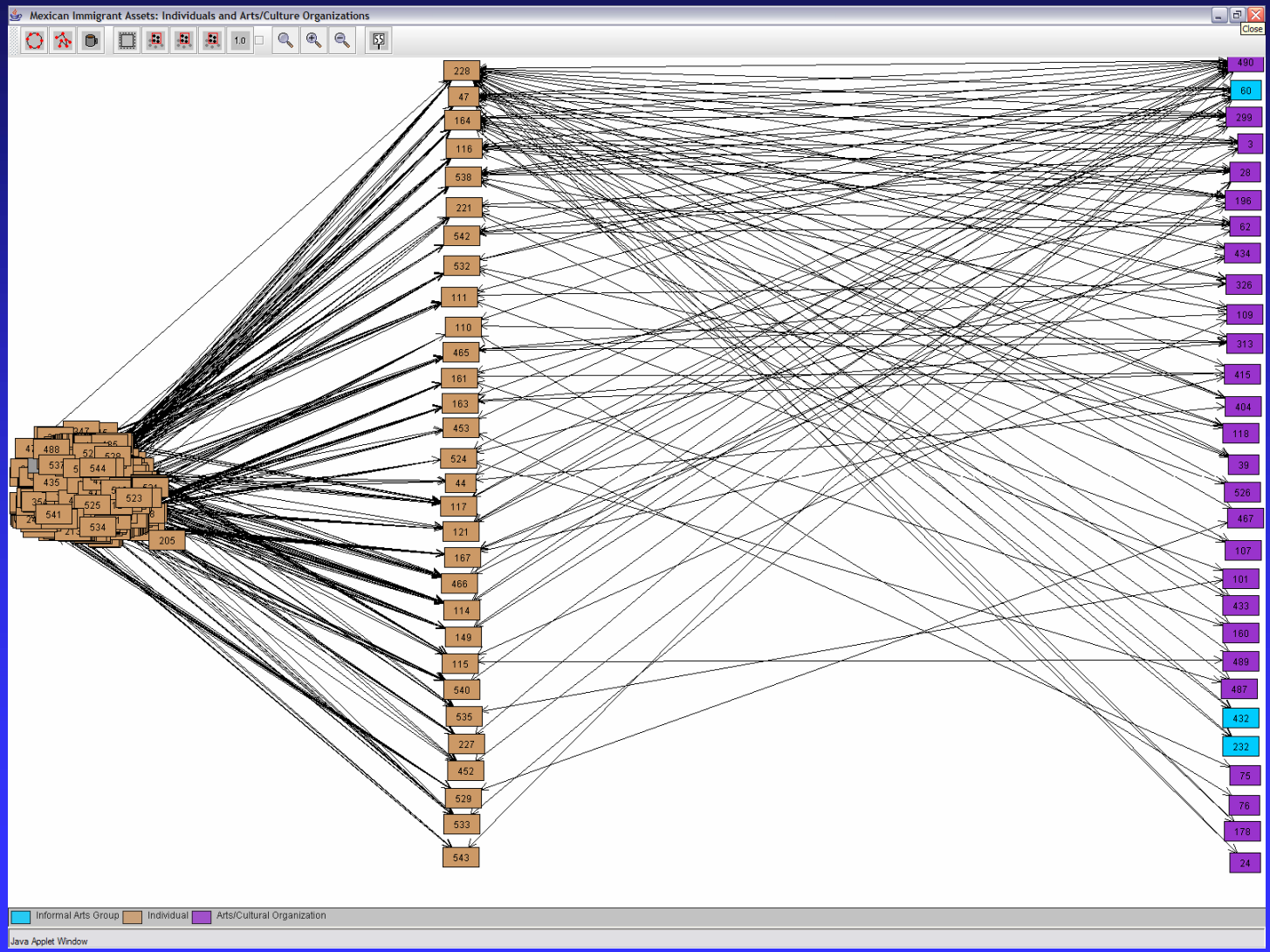
Mapping Cultural & Network Assets in Chicago's Mexican Immigrant Community



Mapping Arts and Culture Activities in Chicago's Mexican Immigrant Community



Re-Mapping Arts and Culture Activities in Chicago's Mexican Immigrant Community



News
Account
Game Info
- Introduction
- Features
- Races
- Classes
- Professions
- New Players
- Game Guide
- Reputations
- Battlegrounds
- Previous Patches
- In Development

Interactive
- PvP Rankings
- Talent Calculators
- Raid Calendar
- World Map
- PvP Mini Site
- War Effort Ranking

Community
- Complete List
- Forums
- Contests
- In-Game Events
- Real-Life Events
- Wallpapers
- Fan Art
- Screenshots
- Spotlight

Forums
- Complete List
- Realm Status
- Technical Support
- Realm Forums
- General
- Suggestions
- PvP Discussion
- Guild Recruitment
- Classes
- Professions
- Guests
- Role-Playing
- UI & Macros
- Code of Conduct

Support
Downloads
- Complete List
- Wallpapers

War Effort Rankings | Lunar Festival | Raid Calendar

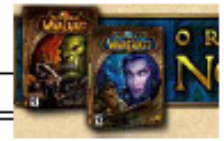
Under Development Page Update - Eyonix on 1/31/06

The Under Development page has just been updated to include some of the cool new features coming in the next content patch, including weather effects! Check it out here.

The Burning Crusade Preview: Karazhan (Medivh's Tower) - Blaze on 1/31/06

Development on the first ever World of Warcraft expansion - The Burning Crusade - continues at a feverish pace, and the dev team has released its first information on one of the new dungeons for the expansion. In this new preview you see screen shots of Karazhan - the tower of the fabled guardian Medivh - as well as background lore providing the first shadowed hints into the terrible dangers and mysteries that await adventurers:

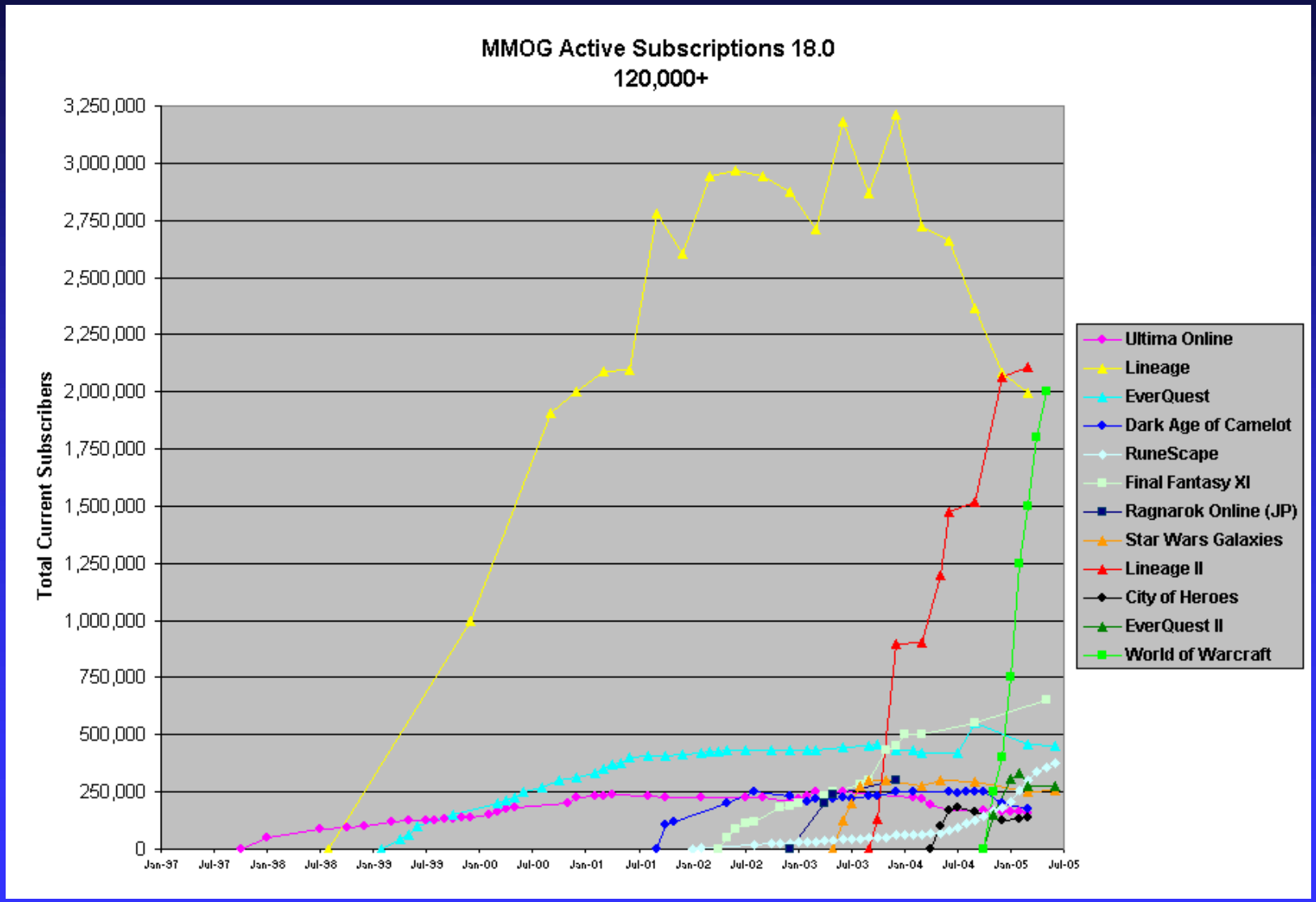
> *Between Duskwood and the Swamp of Sorrows lies the desolate region of Deadwind Pass, where jagged, brooding spires of granite loom over petrified, lifeless forests. As its name suggests, it is a land devoid of life.*
>
> *But it was not always so...*
>
> *Medivh, the Last Guardian, made his home in Deadwind, in the bright tower of Karazhan. Though he was the*



Sign Up Now!
What is World of W
Current Patch Note
Join the Blizzard T

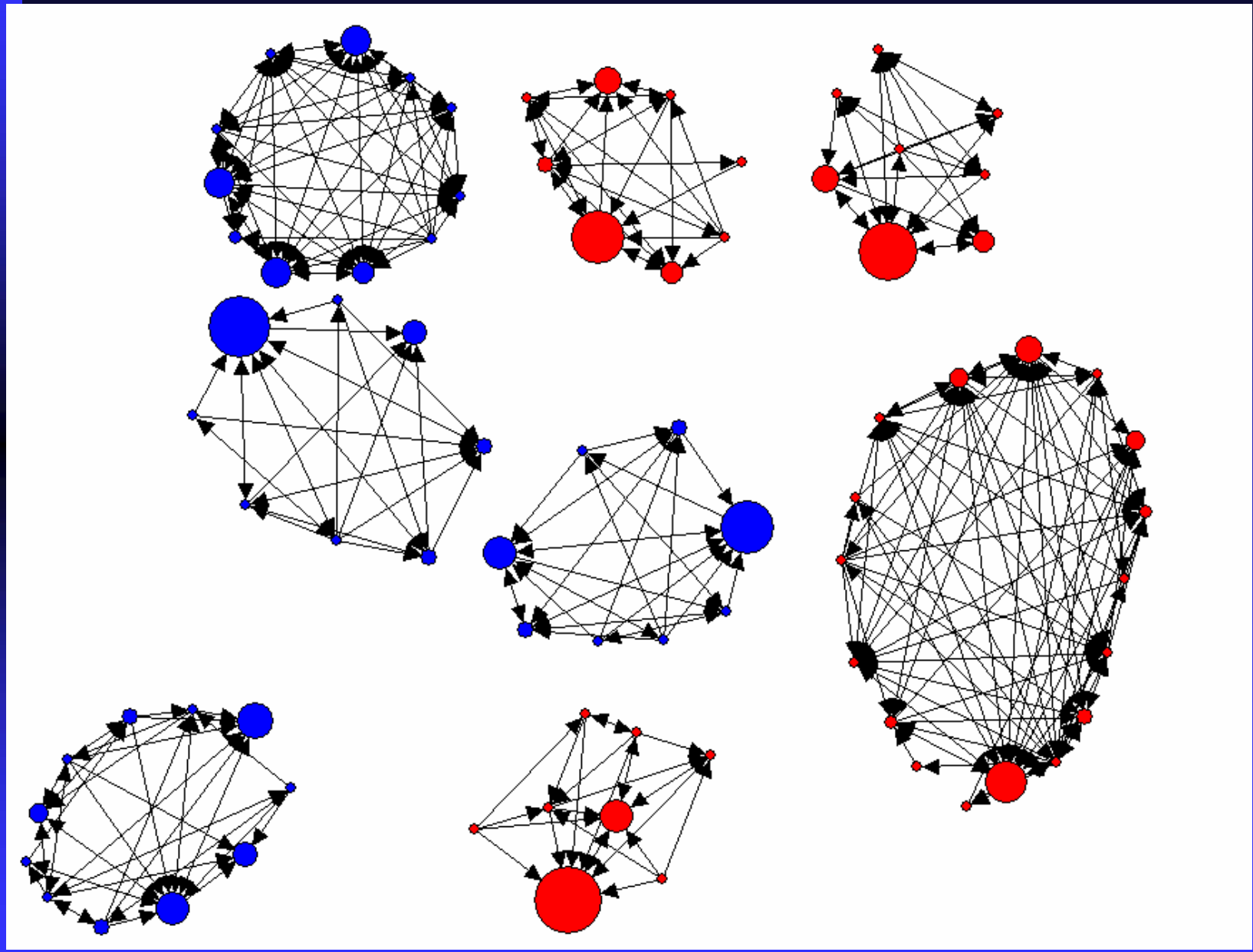
Submit your screenshots

Rise of WoW

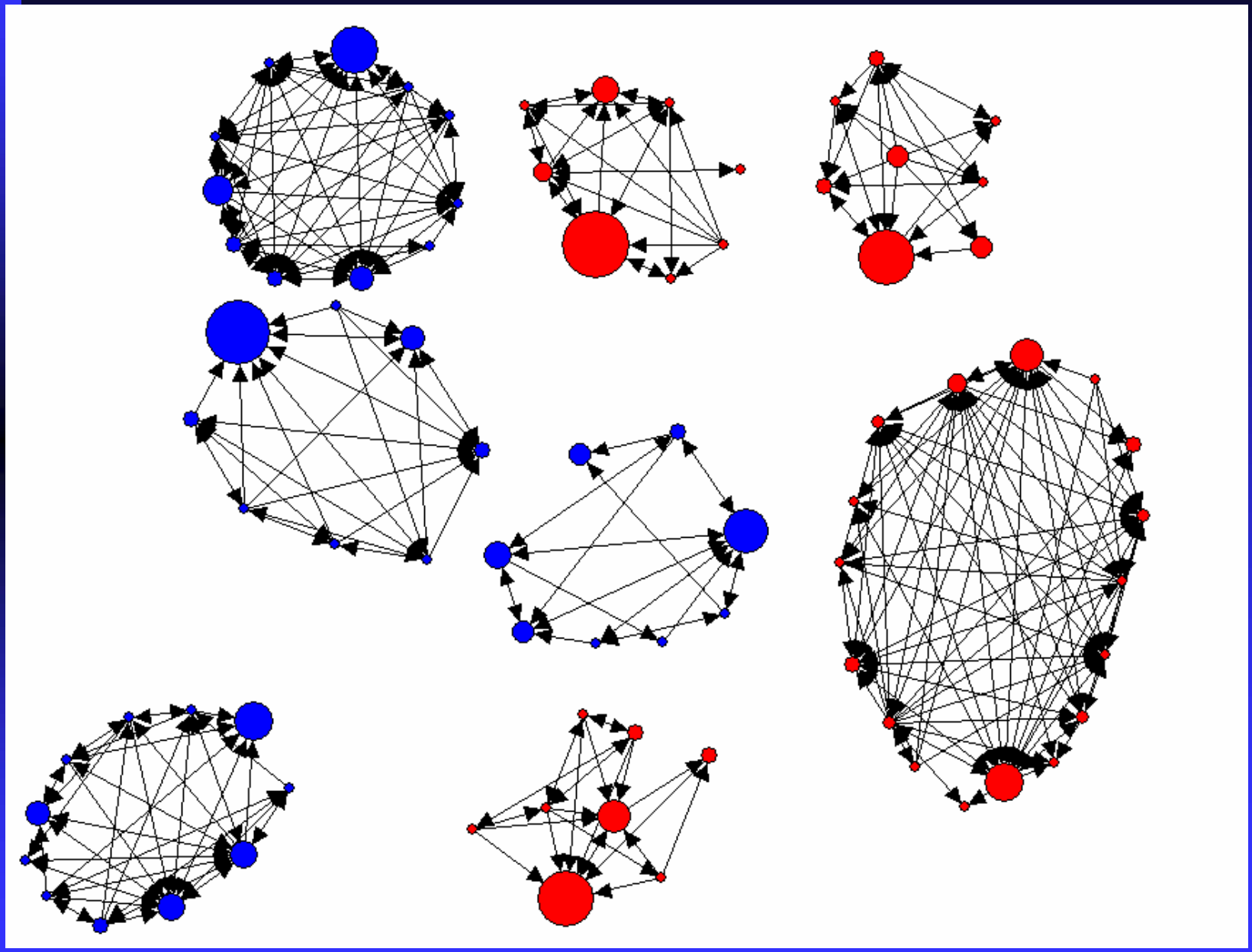


Source: http://www.mmogchart.com/

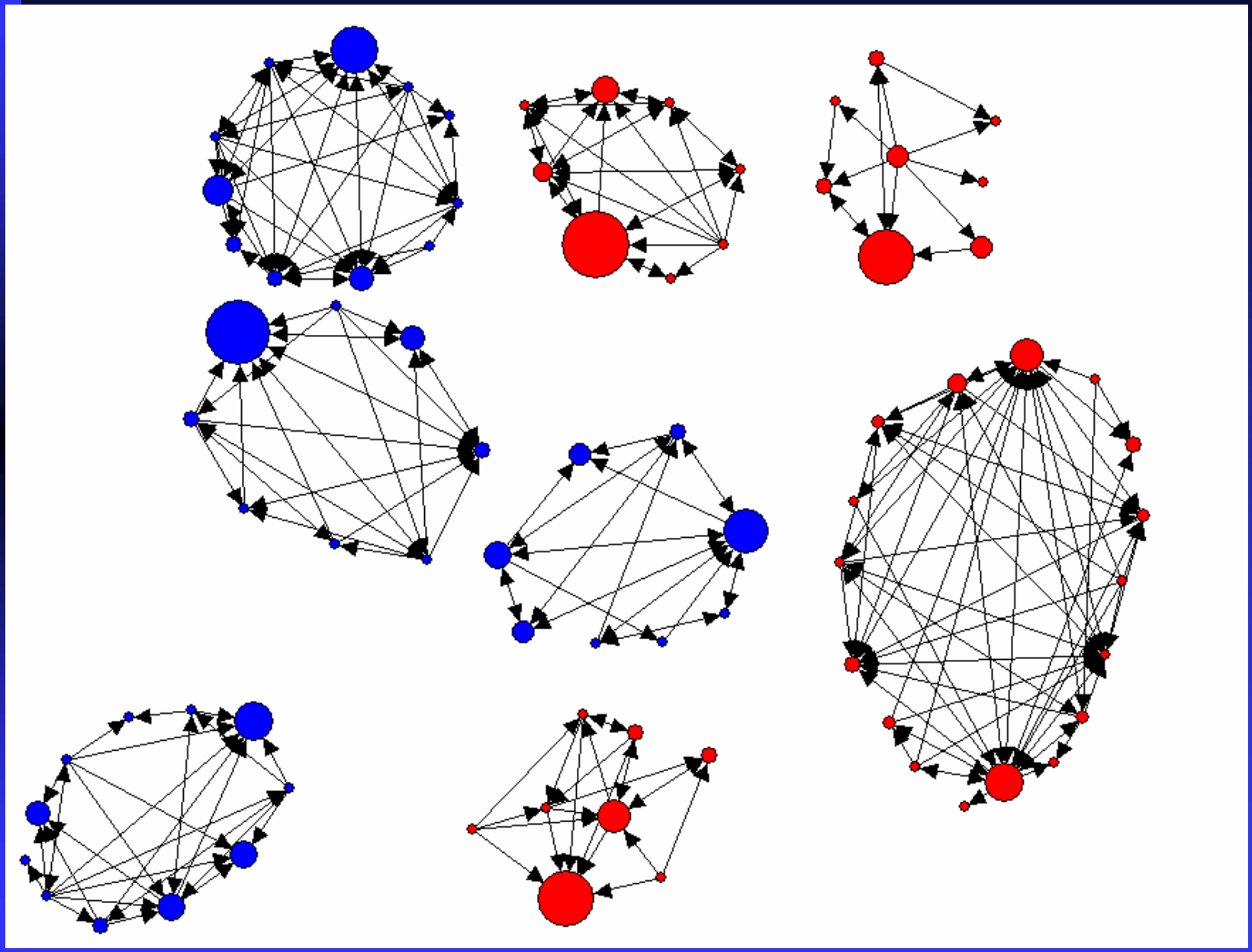
Expertise/Information Retrieval Time One



Expertise/Information Retrieval Time Two



Expertise/Information Retrieval Time Three



Contextualizing Goals of Online Communities

	Exploring	Exploiting	Mobilizing	Bonding	Swarming
Emergency Response Community		+	+		+
WoW Gaming Community		+		+	+
Mexican Immigrant Community		+		+	
PackEdge Communities of Practice	+		+	+	
Economic Resilience NGO Community	+				+
Tobacco Surveillance, Evaluation & Epidemiology Community	+		+		
Environmental Engineering Community	+	+	+		

Mapping *Goals* to Theories: WoW Gaming Community

Exploitation - Collective Action, Cognition, Exchange
Bonding - Balance, Exchange, Homophily, Proximity
Swarming - Collective Action, Cognition, Proximity

	Exploring	Exploiting	Mobilizing	Bonding	Swarming
Emergency Response Community		+	+		+
WoW Gaming Community		+		+	+
Mexican Immigrant Community		+		+	
PackEdge Communities of Practice	+		+	+	
Economic Resilience NGO Community	+				+
Tobacco Surveillance, Evaluation & Epidemiology Community	+		+		
Environmental Engineering Community	+	+	+		

	Exploring	Exploiting	Mobilizing	Bonding	Swarming
Theories of Self-Interest	+		--		
Theories of Collective Action		+	+		+
Theories of Cognition	+	+			+
Theories of Balance	--		+	+	
Theories of Exchange		+		+	
Theories of Contagion	+		+		
Theories of Homophily	--			+	
Theories of Proximity	--			+	+

Unraveling the "Structural Signatures"

- Incentive for creating a WoW link with someone

= -1.55 (cost of creating a link) [Self-interest]

+ 0.55 (benefit of reciprocating) [Exchange]

+ 0.89 (benefit for being a friend of a friend) [Balance]

+ 0.04 (benefit of connecting to an expert) [Cognition]

All coefficients significant at 0.05 level

Summary

- Our early forays into online communities demonstrate a deep desire and success in leveraging technologies to extend human sociability.
- Recent advances in the development of cyberinfrastructure provide the technological capability to leverage the relational metadata needed to more effectively create and sustain online communities.
- Communication scholars are well poised to theorize, research educate, and engage with the formation and impacts of these online communities.

Acknowledgements

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Sid Raja
Doctoral Student, UIUC

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C&T Communities and Technologies 2007

3rd International Conference on Communities and Technologies

June 28~30, 2007

http://ebusiness.tc.msu.edu/cct2007/

●Conference Organizers●

Charles Steinfield, Michigan State University

Brian Pentland, Michigan State University

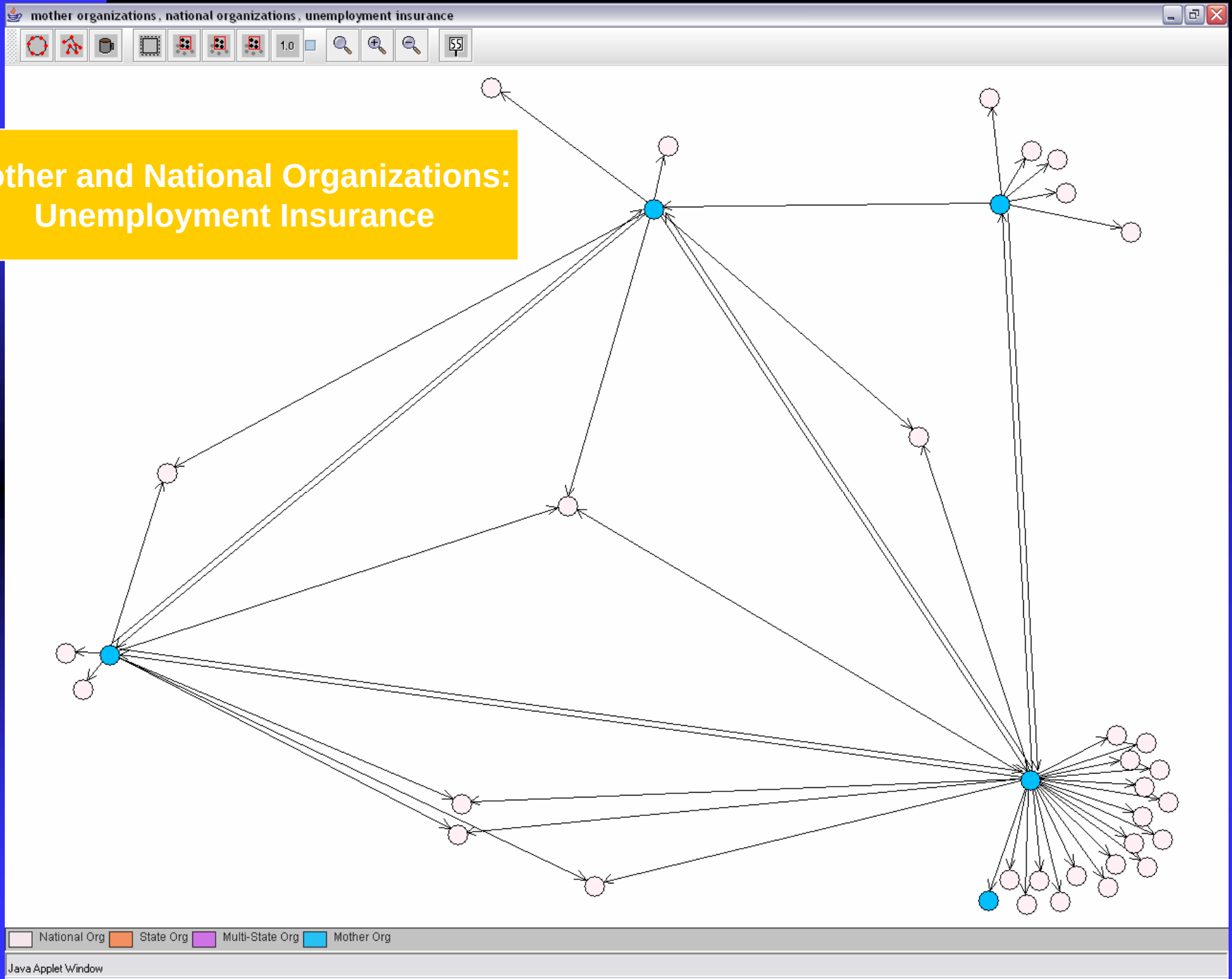
Mark Ackerman, University of Michigan

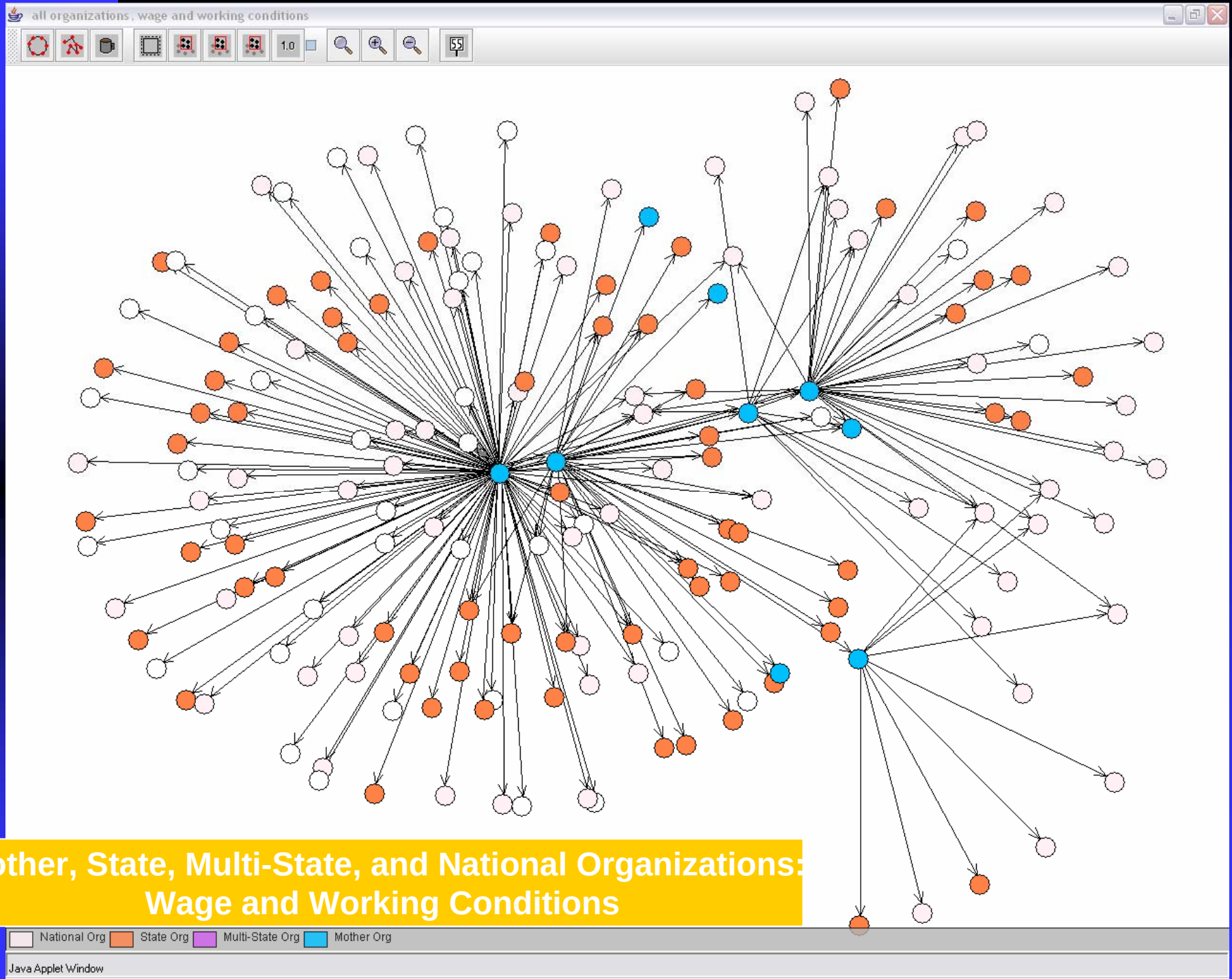
Noshir Contractor, University of Illinois

Hosted by Michigan State University • East Lansing • Michigan • U.S.A.

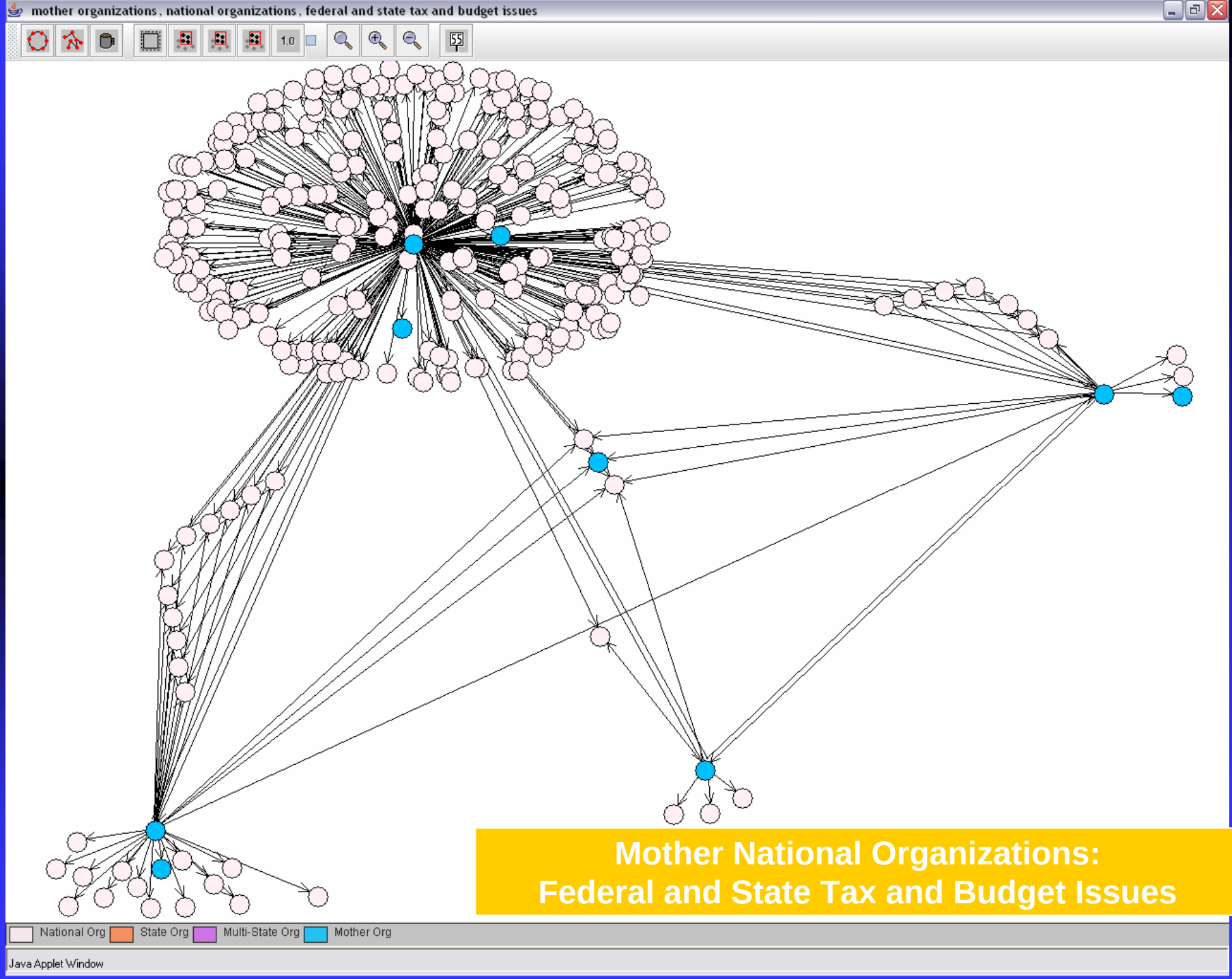
Economic Resilience NGO community

Mother and National Organizations: Unemployment Insurance





Mother, State, Multi-State, and National Organizations: Wage and Working Conditions


mother organizations, national organizations, federal and state tax and budget issues
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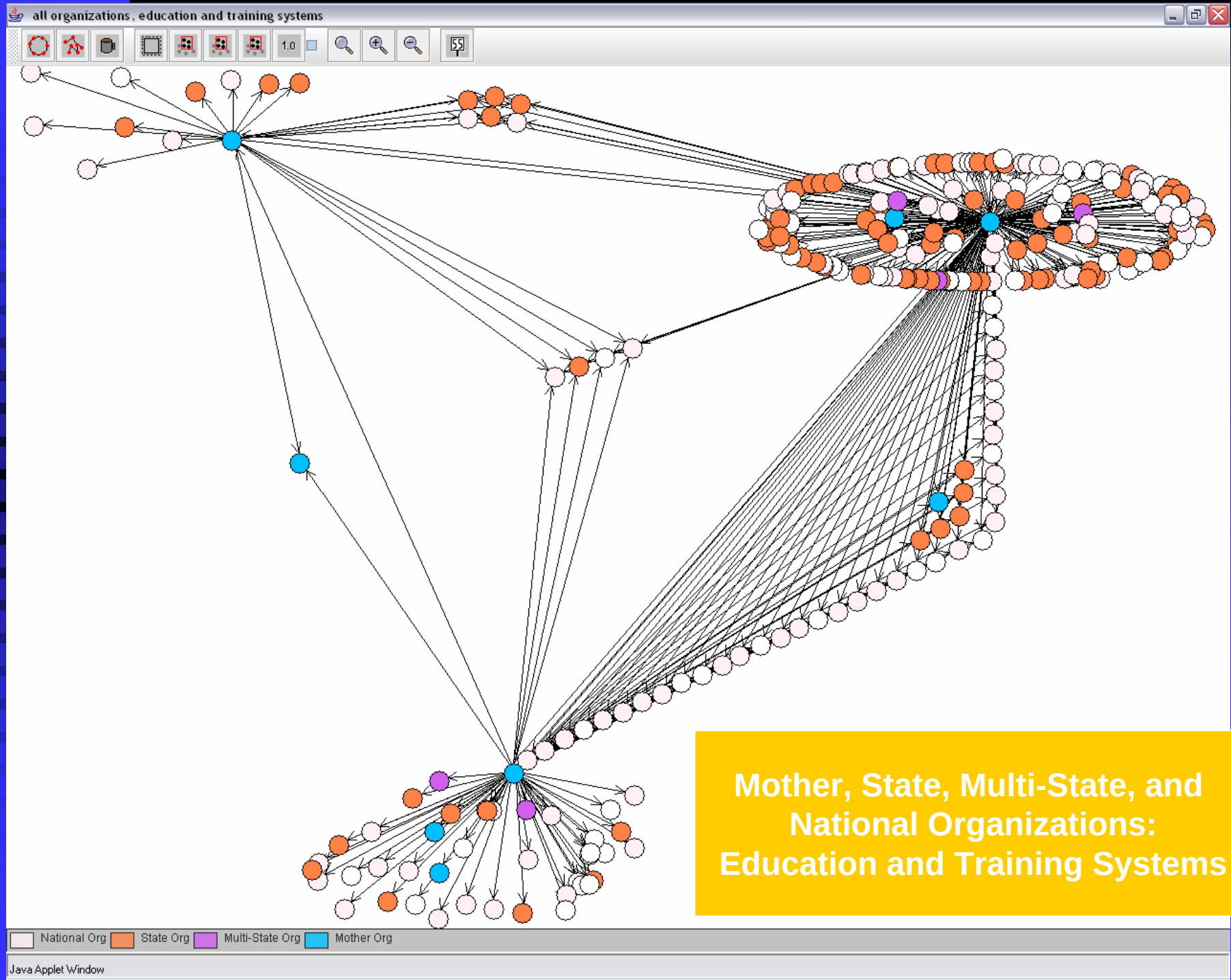
Mother National Organizations:
Federal and State Tax and Budget Issues
National Org
State Org
Multi-State Org
Mother Org
Java Applet Window


all organizations, education and training systems
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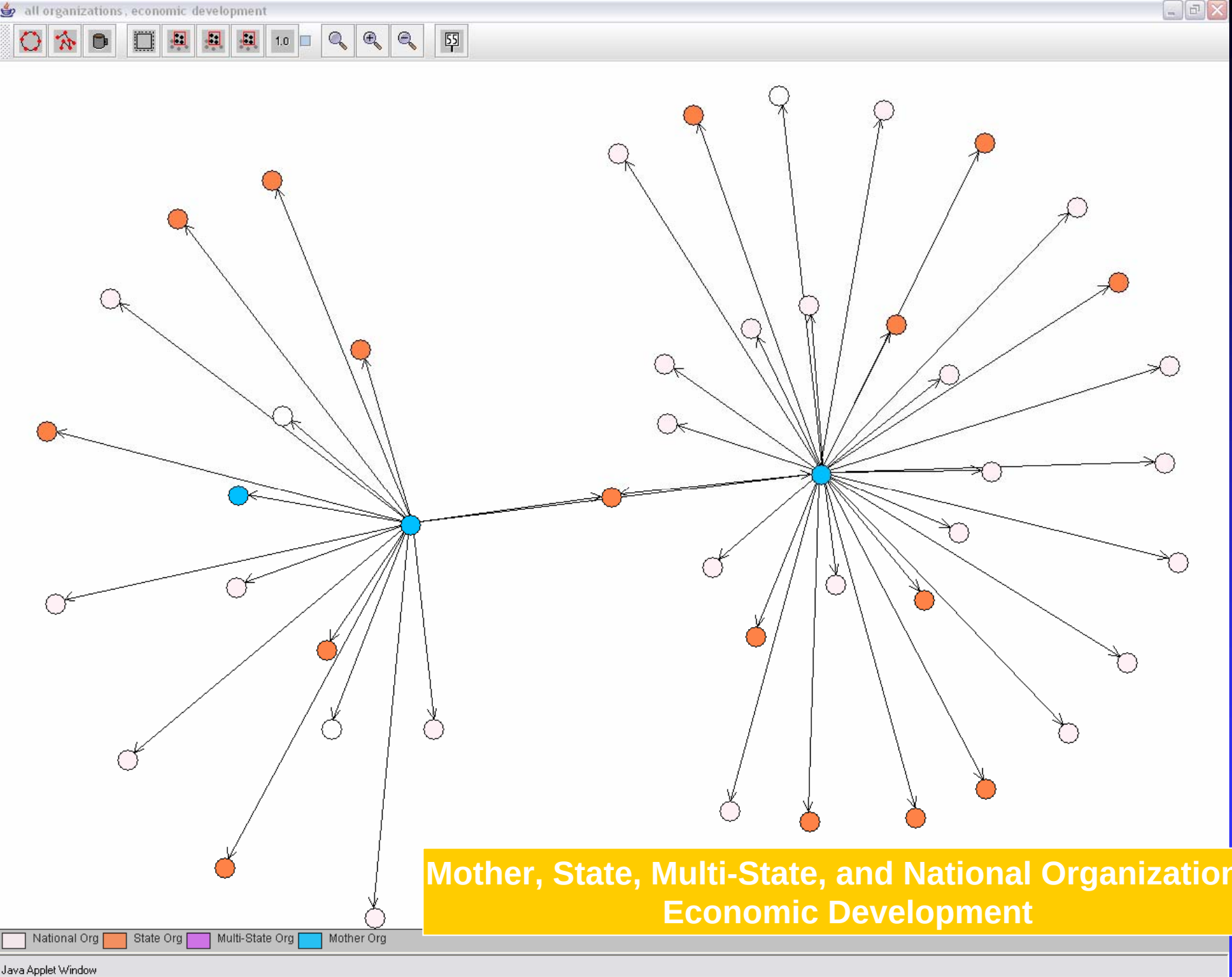
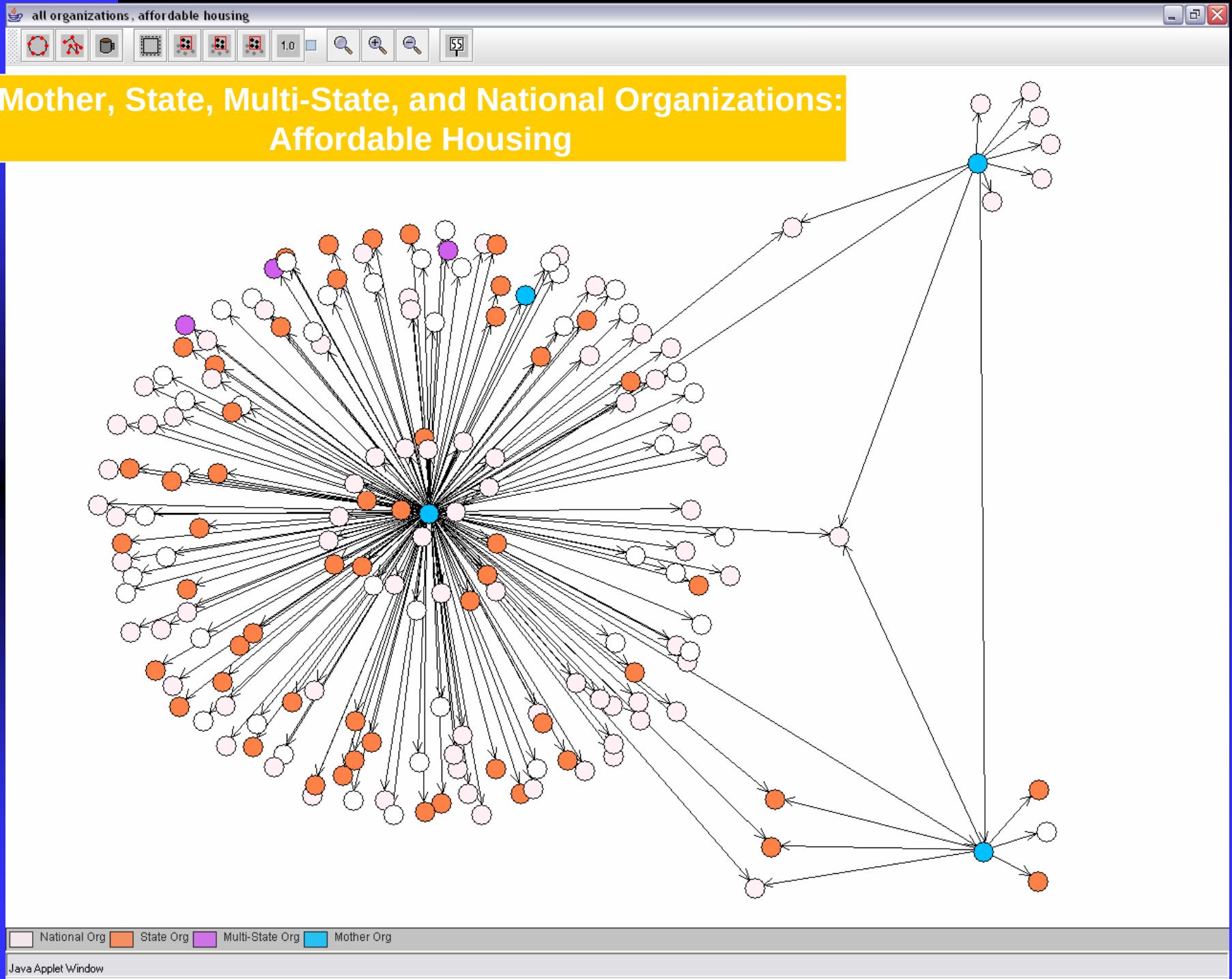
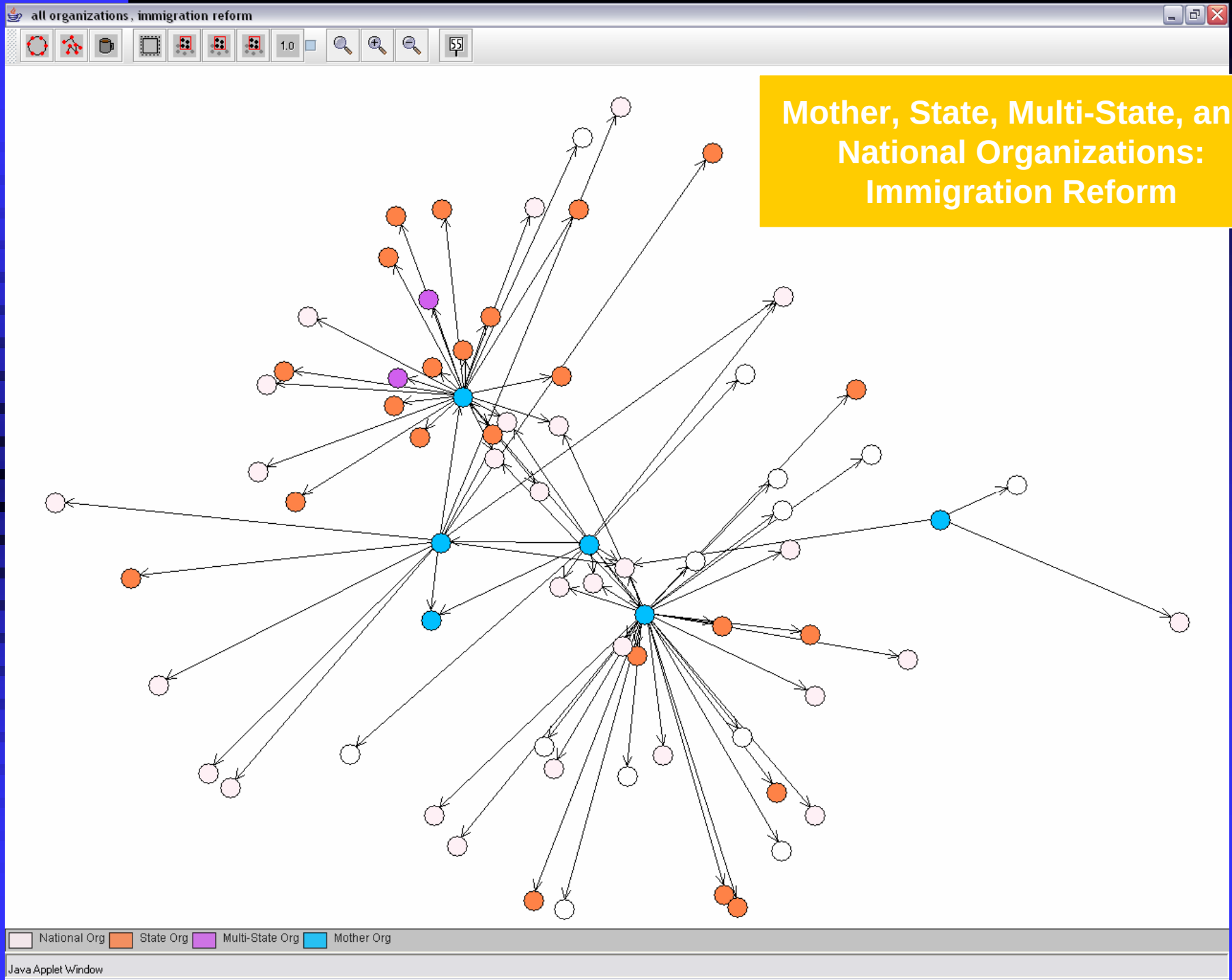
State Org
Multi-State Org
Mother Org
Java Applet Window
Mother, State, Multi-State, and National Organizations: Education and Training Systems



Mother, State, Multi-State, and National Organizations: Economic Development

Mother, State, Multi-State, and National Organizations: Affordable Housing

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Mother, State, Multi-State, and National Organizations: Immigration Reform
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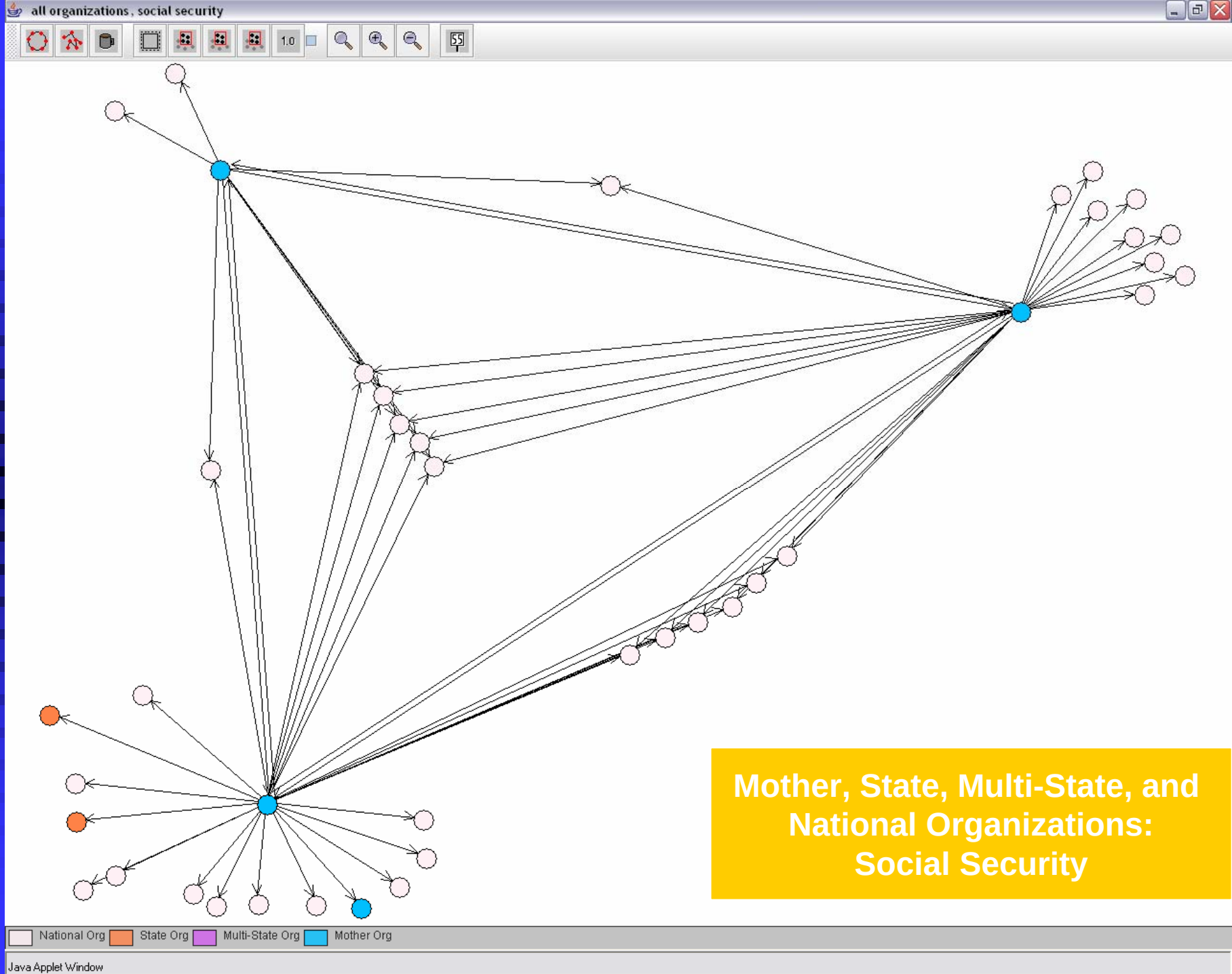
State Org
Multi-State Org
Mother Org
Java Applet Window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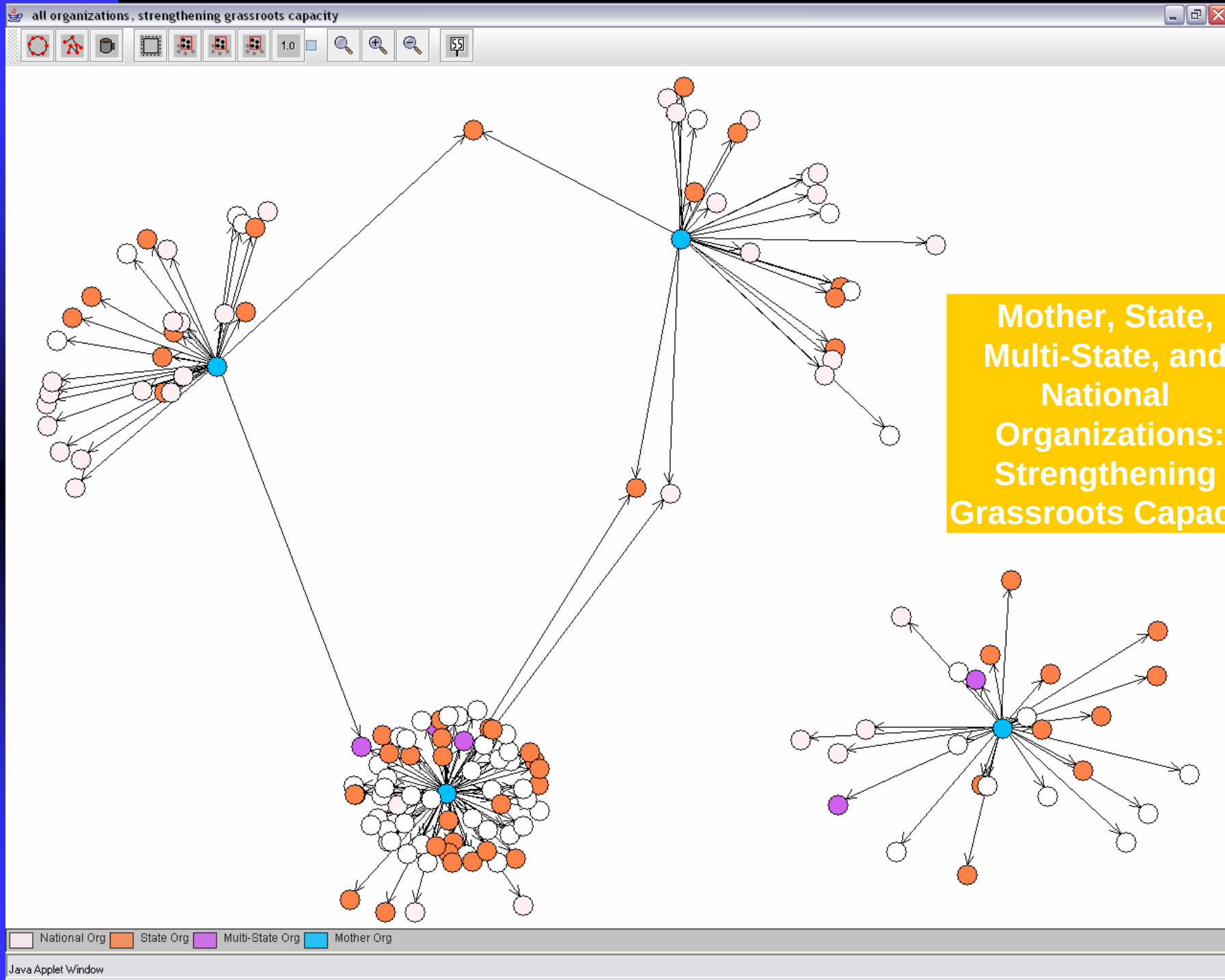
Mother, State, Multi-State, and National Organizations: Social Security


all organizations, strengthening grassroots capacity
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Mother, State, Multi-State, and National Organizations: Strengthening Grassroots Capacity
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Multi-State Org
Mother Org
Java Applet Window